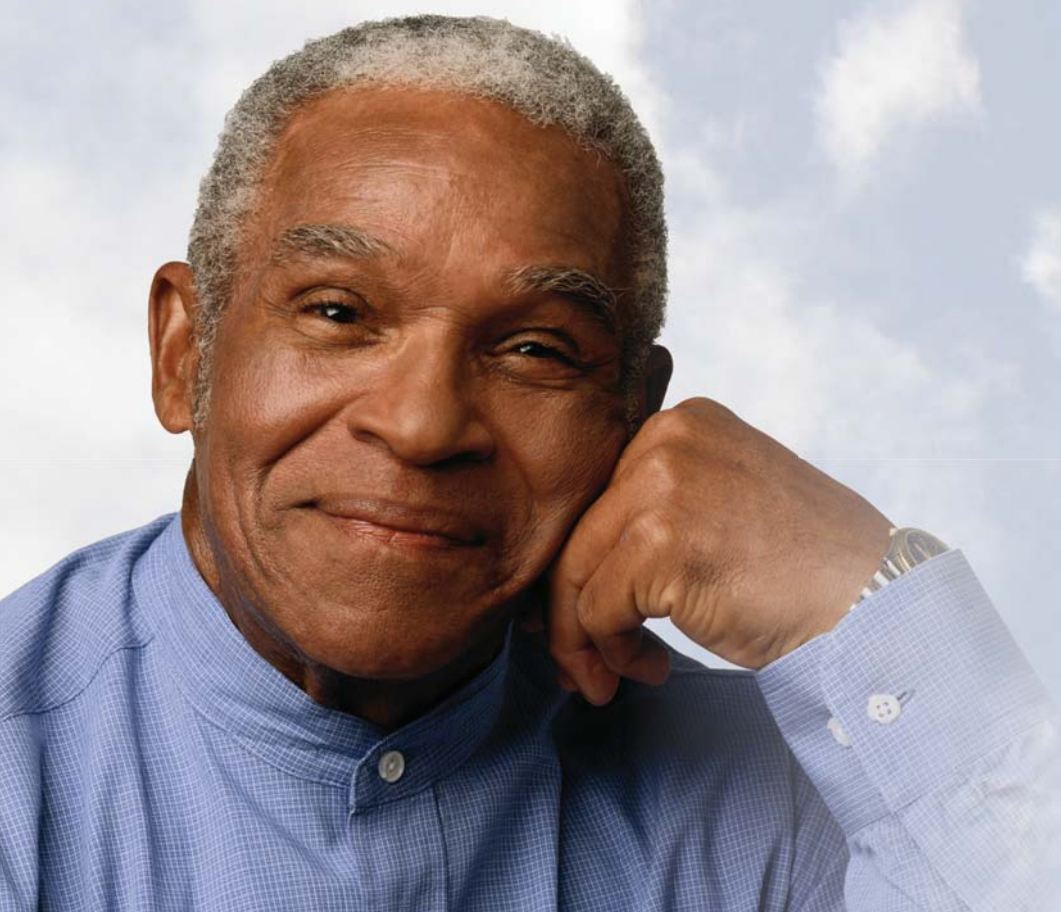


Missouri Asthma Surveillance Report:

The Burden of Asthma in Missouri



2010

Acknowledgments

AUTHORS

Sherri Homan, RN, PhD, Public Health Epidemiologist

Peggy Gaddy, RRT, MBA, Program Coordinator

Shumei Yun, MD, PhD, Chronic Disease Epidemiologist

Missouri Department of Health and Senior Services

Sections of Epidemiology for Public Health Practice and Chronic Disease Prevention and Nutrition Services

Missouri Asthma Prevention and Control Program, Missouri Asthma Coalition and Office of Epidemiology

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Mark VanTuinen, PhD, Research Manager, Craig Ward, BSc, BA, MSW, Research Manager &

Andrew Hunter, PhD, Research Analyst

Missouri Department of Health and Senior Services, Bureau of Health Informatics

Janet Wilson, MEd, MPA, Coordinator

Behavioral Risk Factor Surveillance System and Missouri County-level Study

Noaman Kayani, PhD, Research Analyst & Arthur Pashi, PhD, Research Analyst

Missouri Department of Health and Senior Services, Office of Epidemiology

William T. Wells, PhD, Director

Health and Behavioral Risk Research Center

University of Missouri-Columbia, Department of Health Management & Informatics

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LIST of Abbreviations

ACBS	Asthma Call-Back Survey
BRFSS	Behavioral Risk Factor Surveillance System
CBSA	Core Based Statistical Area
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
CLS	Missouri County-level Study
DHSS	Missouri Department of Health and Senior Services
ED	Emergency Department
EPR-3	Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma
HP	Healthy People (2020)
MAC	Missouri Asthma Coalition
MAPCP	Missouri Asthma Prevention and Control Program
OA	Occupational Asthma
PAS	Patient Abstract System
WEA	Work-exacerbated Asthma
WRA	Work-related Asthma

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Asthma Prevalence and Risk Factors

Asthma is a chronic lung disease characterized by periods of wheezing, chest tightness, shortness of breath and coughing. Symptoms often occur or worsen at night or in the early morning. These symptom occurrences, often referred to as “asthma attacks,” are the result of inflammation and narrowing of the airways due to a variety of factors or “triggers.” While the specific cause of asthma is unknown, the triggers are well documented and described in the glossary along with other definitions and information on the data systems.

*There are 145,000
children currently
living with asthma
in Missouri.*



Missouri Asthma Prevalence and Risk Factors

How many people have asthma in Missouri?

Missouri has an estimated population of 6.0 million people.¹ Approximately 1 in 11 adults and 1 in 10 children in Missouri have asthma.^{1,2} This is a total of more than one-half million individuals.

**Table 1. Lifetime and current asthma prevalence*
Missouri, adults and children**

	Lifetime (%)	95% CI**	Current (%)	95% CI**
Adults	14.5	12.8 - 16.1	9.5	8.1 - 10.9
Children	14.4	11.8 - 17.0	10.1	7.8 - 12.4

See Appendix A for Missouri population description and Appendix B

*Adult prevalence 2009; childhood prevalence 2008.

**Confidence interval (see definitions).

CHILDHOOD ASTHMA PREVALENCE

Among children, what are lifetime and current asthma prevalence rates?

In the 2008 Behavioral Risk Factor Surveillance System (BRFSS), adults were asked about asthma in a randomly selected child living in their household. Fourteen percent of children in Missouri had been diagnosed with asthma, and the majority of those still had asthma (70.2 percent). Current asthma prevalence among children was 10.1 percent; about 145,000 children were living with asthma based on the latest 2008 population estimate (Table 1). The current prevalence of childhood asthma represents an increase since the 2006 and 2007 estimates of 9.5 percent and 8.6 percent, respectively.

How do childhood asthma prevalence rates compare to national rates?

The childhood asthma prevalence questions on the Missouri BRFSS were optional module questions in 2008, so there are no national BRFSS figures available for comparison. However, a similar survey (the National Health Interview Survey) reported that the lifetime asthma prevalence rate for children less than 18 years of age was 13.8 percent in 2008. This is slightly lower than the Missouri prevalence; however, no data on statistical significance were available.

ADULT ASTHMA PREVALENCE

Among adults, what are lifetime and current asthma prevalence rates?

In 2009, 14.5 percent of Missouri adults reported that they had been diagnosed with asthma in their lifetime. Most of those individuals (66.8 percent) reported that they still had asthma. So, 9.5 percent of the adult population, or about 430,000 adults, were currently living with asthma (Table 1).

Among adults, who have asthma in Missouri?

TABLE 2 shows prevalence of current asthma among adults by various demographic factors.^{2, 4} Rates varied among the groups depicted in the table; however, when rates were compared, the prevalence rate was significantly higher among those in the two lower household income groups compared to the highest household income group.

Is adult asthma prevalence on the rise in Missouri?

Among adults, the prevalence rates of both lifetime and current asthma increased between 2000 and 2009. Both trends were statistically significant ($p < .05$) (Figure 1).

Figure 1. Lifetime and current asthma prevalence rates by year, Missouri 2000-2009, adults

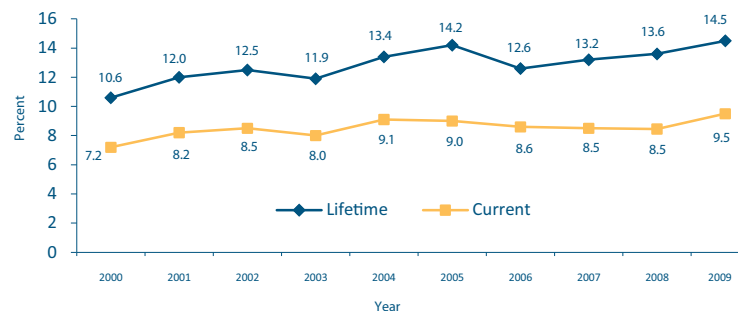


Table 2. Prevalence of current asthma by demographic characteristics, Missouri, 2009

	Currently with Asthma %	95% CI
Gender		
Male	7.8	5.5 - 10.1
Female	11.1	9.4 - 12.8
Race/Ethnicity		
White, Non-Hispanic	9.0	7.5 - 10.5
African-American, Non-Hispanic	10.3	6.5 - 14.1
Other, Non-Hispanic	--	--
Multi-racial, Non-Hispanic	--	--
Hispanic	6.0	0.0 - 12.0
Age Group in Years		
18 - 24	14.1	6.1 - 22.1
25 - 34	10.9	6.9 - 14.9
35 - 44	6.9	4.5 - 9.4
45 - 54	9.6	6.9 - 12.2
55 - 64	8.9	6.7 - 11.0
65 and older	8.3	6.6 - 9.9
Annual Household Income		
Less than \$15,000	14.9*	8.7 - 21.1
\$15,000 - \$24,999	13.8*	9.7 - 17.8
\$25,000 - \$34,999	6.9	4.2 - 9.6
\$35,000 - \$49,999	10.6	6.0 - 15.3
\$50,000 and greater	6.7	4.9 - 8.6
Education		
Less than High School	16.3	9.6 - 22.9
High School or GED	7.7	5.7 - 9.7
Some Post-High School	9.9	7.2 - 12.5
College Graduate	8.8	6.3 - 11.3
Overall State Rate	9.5	8.1 - 10.9

*Significantly different than one or more group categories.

--Sample size too small to calculate prevalence.

How do Missouri adult asthma prevalence rates compare to national rates?

Table 3 shows that both lifetime and current asthma prevalence rates in 2009 were higher for Missouri than for the national median.⁴ Statistical significance could not be determined. This was true for all years shown with the exception of 2008.

Table 3: Asthma prevalence rates, adults, Missouri and national median, 2005-2009

	Missouri		National Median	
	Lifetime (%)	Current (%)	Lifetime (%)	Current (%)
2005	14.2	9.0	12.6	8.0
2006	12.6	8.6	13.0	8.5
2007	13.2	8.5	13.1	8.4
2008	13.6	8.4	13.6	8.8
2009	14.5	9.5	13.5	8.8

What risk factors for asthma complications are reported among adults with current asthma?

Although the exact cause of asthma is unknown, the factors associated with having asthma and increasing the risk of episodes or attacks are better defined. Some important risks for asthma episodes include smoking, poor air quality, such as exposure to environmental tobacco smoke (ETS), and respiratory illnesses.^{5,6} Using data from the 2007 Missouri County-level Study (CLS) and BRFSS, the prevalence of selected asthma risk factors were compared among adults with current asthma and those not currently living with asthma^{7,8} (Table 4).

Table 4. Factors increasing asthma risk, Missouri, 2007, adults

Risk Factor	Current Asthma		No Current Asthma	
	%	95% CI	%	95% CI
Current smoker	29.2*	25.3 - 33.1	22.5	21.6 - 23.7
Smoking permitted in home	40.2*	36.2 - 44.3	31.6	30.5 - 32.7
Obesity	40.8*	36.7 - 44.9	28.0	26.9 - 29.1
No flu shot	55.7	48.8 - 62.6	64.5	62.5 - 66.5
Never had pneumococcal vaccination (age 65 and older)	59.7*	52.6 - 66.7	75.9	74.0 - 77.7

See Appendix B for BRFSS questions and Appendix C for a list of Missouri CLS questions.

*Difference between those with current asthma and those without asthma was statistically significant.

Significantly more people with asthma currently smoke cigarettes than those without asthma. Also significantly more individuals with current asthma were potentially exposed to ETS in the home because smoking was allowed in the home or because there were no rules against smoking in the home.

Individuals with a chronic disease, including asthma, are recommended to receive vaccinations against influenza and other communicable respiratory diseases, like pneumonia. More than one-half of those with current asthma had not received a flu shot in the last year and six out of 10 seniors with current asthma had not been vaccinated against pneumonia in their lifetime.

What health care access issues are reported among adults with current asthma?

Table 5 shows the differences in health care access between adults with asthma and adults without asthma. Almost 17 percent of those with current asthma said they did not have any health care coverage (such as commercial health insurance, HMOs, or government sources such as Mo HealthNet [Missouri's Medicaid] or Medicare). This was not significantly different from those without current asthma.

Table 5. Health care access Missouri, 2007, adults

Indicator	Current Asthma		No Current Asthma	
	%	95% CI	%	95% CI
No health care coverage	16.8	13.7 - 20.0	14.9	14.0 - 15
No usual place of health care	3.3*	2.3 - 4.2	6.7	6.1 - 7.4
Needed medical care in past 12 months but could not get it	17.8*	14.5 - 21.2	6.5	6.0 - 7.0
Unable to obtain health care due to cost†	64.2~	53.7 - 74.7	69.4	65.8 - 72.9

See Appendix C for Missouri CLS questions.

*Difference between those with current asthma and those without asthma was statistically significant.

†Of the people who needed medical care in the past 12 months but could not get it.

Only about 3 percent of those with current asthma reported that they had no usual source of health care. Twice as many of those who did not have asthma reported that they did not have a usual source of health care. This difference was statistically significant. Of the people who experienced a barrier to health care services in the past 12 months, approximately two-thirds of those with asthma as well as those without asthma reported it was due to cost or no health insurance.

17% of those with asthma have no health care coverage.



WORK-RELATED ASTHMA

There are two categories of work-related asthma:⁹

- Occupational asthma (OA) – a new case of asthma that develops following exposure to a sensitizer or irritant (e.g., chemical, allergen or other agent) in the workplace
- Work-exacerbated asthma (WEA) – preexisting asthma or concurrent asthma (i.e., occurring at the same time from outside work exposures) that is worsened by work factors

It is unknown how many workers in Missouri are potentially exposed to agents that cause or exacerbate asthma, but nationally it is estimated that as many as 25 percent of adult asthmatic patients have WRA.⁹

What is the prevalence of work-related asthma in Missouri?

Among adults who reported that they had been diagnosed with asthma during their lifetime and responded to the 2006 Adult Asthma Call-back Survey in Missouri, 17.2 percent

said that their asthma was caused by chemical, smoke, fumes or dust in their current job.¹⁰ A smaller proportion (13.7%) reported their asthma was caused by a previous job. However, one-fifth of adults (21.6%) reported changing or quitting a job because chemicals, smoke, fumes or dust made their asthma worse. (See Appendix D for Asthma Call-Back Study questions.)

300,000 adults in MO have been told their asthma is work-related.



Health Outcomes

There are a variety of health outcomes that affect people with asthma. The first outcome described here is health-related quality of life as measured by the 2007 Missouri County-level Study (CLS). The Missouri CLS interviewed a total of 49,513 adults, age 18 and older. Missouri CLS data can be used to compare different health-related quality of life measures among adults currently living with asthma and those who do not currently have asthma. Data reported by the Missouri Information for Community Assessment (MICA) system are also important for describing the impact of asthma in Missouri. These include information on asthma emergency department (ED) visits, hospitalizations and deaths. (See Appendix C for Missouri CLS questions and Appendix E for Patient Abstract System and Missouri Vital Statistics Information.)

Health-Related Quality of Life: adults

How many adults with current asthma said their general health was fair or poor?

One-third of those with current asthma said their general health was fair or poor (Table 6). This is significantly higher than the percentage of those without current asthma who reported their general health as fair or poor.

Table 6. Health-related quality of life measures, Missouri, 2007, adults

Indicator	Current Asthma		No Current Asthma	
	%	95% CI	%	95% CI
General health fair or poor	35.6*	31.9 - 39.3	15.0	14.3 - 15.7
14 or more physically unhealthy days in the last 30 days	26.7*	23.2 - 30.1	11.1	10.4 - 11.8
14 or more mentally unhealthy days in the last 30 days	24.4*	20.8 - 28.0	11.2	10.4 - 12.0
Activity limitation†	44.4*	40.4 - 48.5	19.8	18.9 - 20.7

See Appendix C for Missouri CLS questions.

*Difference between those with current asthma and those without current asthma was statistically significant.

† Limited because of physical, mental or emotional problems.

How many adults with current asthma said their physical health was not good 14 or more days during the past 30 days?

More than a quarter of those with current asthma said their physical health was not good 14 or more days in the last month (Table 6). This is significantly higher than those who were not currently living with asthma.

How many adults with current asthma said their mental health was not good 14 or more days during the past 30 days?

Almost one of every four people currently living with asthma reported that their mental health was not good 14 or more days during the last 30 days, and this was significantly higher than those who did not currently have asthma (Table 6).

How many adults with current asthma were limited in some way by their physical, mental or emotional health problems?

More than twice as many people with current asthma reported that their activity was limited in some way due to physical, mental or emotional issues than those without asthma (Table 6). This difference was significantly higher than those without current asthma.

What is the mean number of physically unhealthy days during the past 30 days reported by those with current asthma?

Adults with asthma reported an average of 8.3 days per month that their physical health was not good (Table 7). This was significantly higher than the mean number reported by adults not currently living with asthma.

Table 7. Health-related quality of life measures, Missouri, 2007, adults

Indicator	Current Asthma		No Current Asthma	
	Days	95% CI	Days	95% CI
Mean physically unhealthy days	8.3*	7.4 - 9.2	3.6	3.5 - 3.8
Mean mentally unhealthy days	7.6*	6.6 - 8.5	3.6	3.4 - 3.8
Mean days of activity limitation†	8.2*	7.8 - 8.5	4.2	4.1 - 4.2

See Appendix C for Missouri CLS questions.

* Difference between those with current asthma and those without current asthma was statistically significant.

† Usual activity limited because of poor physical or mental health.

What is the mean number of mentally unhealthy days during the past 30 days reported by those with current asthma?

Adults with asthma reported an average of 7.6 days per month that their mental health was not good (Table 7). This was significantly higher than the mean number reported by adults not currently living with asthma.

What is the mean number of days that poor physical or mental health limited activity during the past 30 days reported by those with current asthma?

Adults with current asthma reported that their usual activity such as self-care, work or recreation was limited by poor

health an average of 8.2 days in the past month (Table 7). This was significantly higher than the mean number reported by adults not currently living with asthma.

EMERGENCY DEPARTMENT VISITS

How many ED visits occur each year due to asthma?

In 2008, 29,695 ED visits were reported with asthma as the underlying cause.¹¹ The age-adjusted ED rate for all Missouri residents was 5.2 per 1,000 population (Table 8).

What groups visit the ED the most due to asthma?

Table 8 shows that age-adjusted asthma ED visit rates were higher among females than males; this difference was statistically significant. Rates were higher among African-Americans than whites, and this difference was also statistically significant. Rates were significantly higher among white females than white males. African-American male and female rates were not significantly different.

Which age groups visit the ED the most due to asthma?

Figure 2 shows ED visit rates were highest among younger individuals and particularly among African-Americans. Rates were especially high for ages one to four and five to nine. The lowest rates were observed for those 65 and older.

How do asthma ED visit rates vary by race and age?

Figure 2 shows that rates were much higher for African-Americans than whites in all age categories. All of these differences were statistically significant.

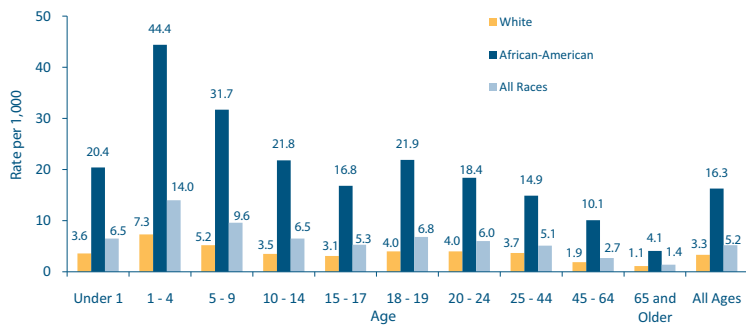
Table 8. Age-adjusted asthma emergency department visit rates* by race and gender, Missouri, 2008

Race	Number	Males		Females			Total		
		Rate	95% CI	Number	Rate	95% CI	Number	Rate	95% CI
White	6,505	2.7	2.6 - 2.8	9,366	3.8	3.8 - 3.9	15,871	3.3	3.2 - 3.3
African-American	6,375	16.4	16.0 - 16.8	6,198	16.0	15.6 - 16.4	12,573	16.3	16.1 - 16.6
All Races	13,568	4.7	4.6 - 4.8	16,127	5.6	5.5 - 5.7	29,695	5.2	5.1 - 5.2

See Appendix E for PAS information

*Rates per 1,000 population. Age-adjustment uses U.S. 2000 standard population.

Figure 2. Asthma emergency department visit rates by race and age group, Missouri 2008, males and females



What is the extent of the racial disparity in asthma ED visits?

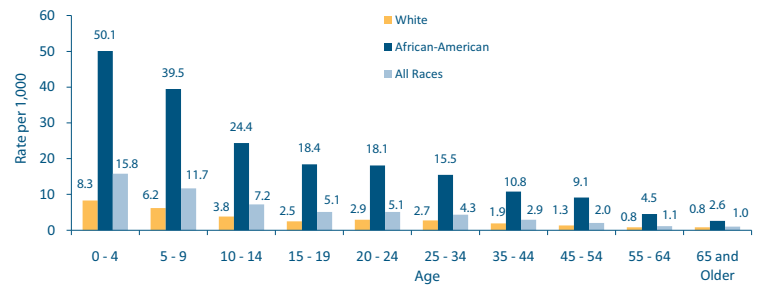
The rate ratios depicted in Table 9 show how many times higher the African-American ED rate was compared to the white rate. The rate ratios were especially high in younger individuals (under 20 years of age) but they were also elevated among those 45 to 54. The lowest rate ratio was among those 65 and over, although African-Americans in this age group were at a 3.7 times greater risk of visiting the ED due to asthma than whites.

Table 9. Asthma emergency department visit rate ratio for African-Americans compared to whites by age group, Missouri 2008, males and females

Age in Years	Rate Ratio
0 to 4	6.1
5 to 9	6.1
10 to 14	6.2
15 to 19	5.5
20 to 24	4.6
25 to 34	4.1
35 to 44	3.9
45 to 54	5.5
55 to 64	4.6
65 and older	3.7

Figure 3 shows asthma ED visit rates were higher among younger males than older males. Rates were especially high for those under 15 years of age. The lowest rates were observed for those in older age groups.

Figure 3. Asthma emergency department visit rates by race and age group, Missouri 2008, males



Among males, which age groups visit the ED the most due to asthma?

Figure 3 shows that rates were much higher for African-American males than white males in all age categories. All of these differences were statistically significant.

Among males, how do asthma ED visit rates vary by race and age?

Figure 3 shows that rates were much higher for African-American males than white males in all age categories. All of these differences were statistically significant.

Among males, what is the extent of the racial disparity in asthma ED visits?

Table 10 shows that rate ratios were especially high among the young (under 20 years of age) and older individuals (45 to 54), but they were considerable among all age groups. The lowest rate ratio was among African-American males 65 and older, who were at a 3.3 times greater risk of visiting the ED due to asthma than whites of the same age.

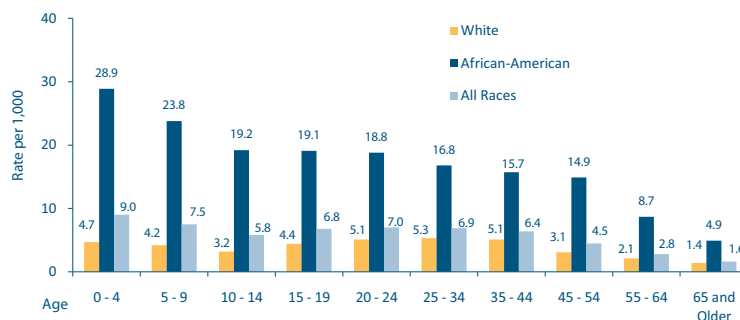
Table 10. Asthma emergency department visit rate ratio for African-Americans compared to whites by age group, Missouri 2008, males

Age in Years	Rate Ratio
0 to 4	6.1
5 to 9	6.4
10 to 14	6.4
15 to 19	7.2
20 to 24	6.2
25 to 34	5.7
35 to 44	5.7
45 to 54	7.0
55 to 64	5.6
65 and older	3.3

Among females, which age groups visit the ED the most due to asthma?

Figure 4 shows ED visit rates were highest among the younger females (under 5 years of age) and lowest among older individuals (65 and older).

Figure 4. Asthma emergency department visit rates by race and age group, Missouri 2008, females



Among females, how do asthma ED visit rates vary by race and age?

Figure 4 shows that rates were much higher for African-American females than white females in all age categories. All of these differences were statistically significant.

Among females, what is the extent of the racial disparity in asthma ED visits?

The rate ratios were especially high among the young (younger than 15 years of age) but the ratio was also elevated for the 45 to 54 age group (Table 11). The lowest rate ratios were among African-American females 25 to 44, who still remained about three times more likely to visit the ED due to asthma than white females of the same age.

Table 11. Asthma emergency department visit rate ratio for African-Americans compared to whites by age group, Missouri 2008, females

Age in Years	Rate Ratio
0 to 4	6.1
5 to 9	5.7
10 to 14	6.0
15 to 19	4.4
20 to 24	3.7
25 to 34	3.2
35 to 44	3.1
45 to 54	4.8
55 to 64	4.1
65 and older	3.5



How does the racial disparity in asthma ED visits differ among males and females?

Tables 10 and 11 show that African-American males and females were more likely to visit the ED due to asthma than whites in all age groups. However, the extent of this disparity in males and females varied by age. Rate ratios were similar among males and females younger than 15 years of age. Ratios were larger for African-American males than African-American females in age categories that included those 15 to 65 years of age. Ratios were larger for African-American females over age 65.

How do male and female asthma ED visit rates compare by age?

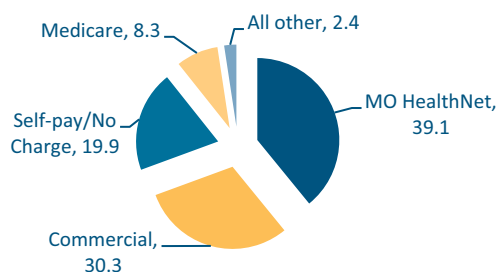
Figures 3 and 4 show that age-specific rates differed somewhat for males and females. Rates were significantly lower for females 14 and younger and significantly higher for females in all age groups 15 years and older compared to males.

What payment sources cover asthma ED visits in Missouri?

Figure 5 shows that the two most common payment sources for asthma ED visits among all Missourians were MO HealthNet (Missouri's Medicaid) and commercial health insurance. One-fifth of all visits to the ED due to asthma were in the self pay/no charge category.

It is important to note that the "all other" category in this section includes other government payment sources, worker's compensation, and "other" payment sources. Unknowns represented a small proportion (0.8 percent) of the total and were also included in the "all other" category.

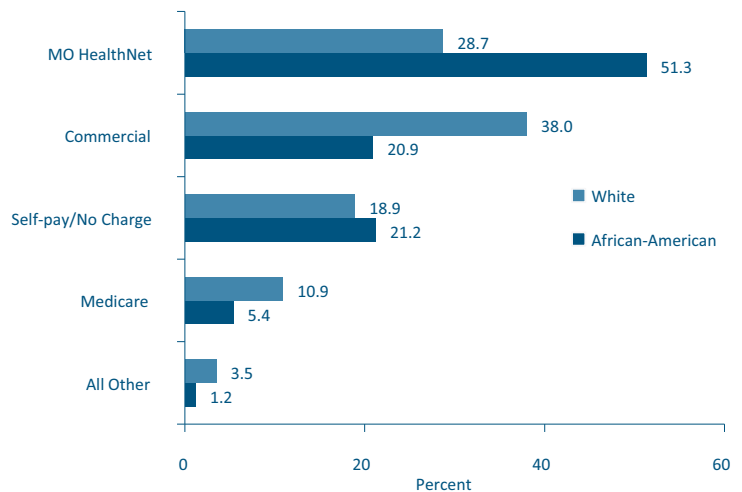
Figure 5. Percent of asthma emergency department visits by expected payment source, Missouri, 2008



How do asthma ED visit payment source proportions vary by race?

Figure 6 shows that the most common payment source for white ED visits was commercial health insurance (38.0%), followed by MO HealthNet (28.7%). The most common payment source for African-American ED visits was MO HealthNet (51.3%) followed by self-pay/no charge (21.2 percent) and commercial health insurance (20.9%).

Figure 6. Percent of asthma emergency department visits by expected payment source and race, Missouri, 2008



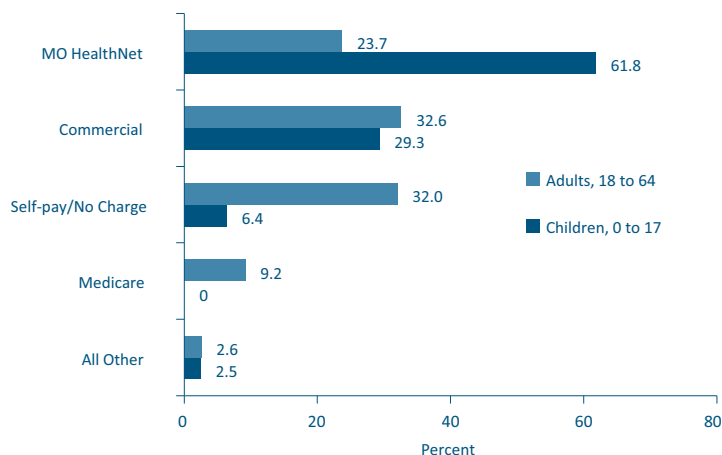
How do asthma ED visit payment source proportions vary by age?

Figure 7 provides ED visit proportions by payment source for children age 17 years and younger and adults 18 to 64 years of age. For children, Medicaid covered the majority of ED asthma visits. For adults, the two most common payment sources were commercial insurance and self-pay/no charge followed closely by MO HealthNet. Commercial insurance was listed as the payment source for about one-third of the visits.

The adult age range was selected because Medicare primarily covers individuals 65 years and older. In fact, Medicare covered 87.5 percent of asthma ED visits among seniors, 65 years and older, in 2008. However, Medicare does cover individuals with certain health conditions who are younger than age 65.¹² Slightly more than 9 percent of ED visits among individuals 18 to 64 were covered by Medicare (Figure 7). The "all other" category includes other

government payment sources, worker's compensation, other payment sources, and unknown. As shown in Figure 7, the "all other" category totaled less than 3 percent for adults and children.

Figure 7. Percent of asthma emergency department visits by expected payment source and age group, Missouri, 2008



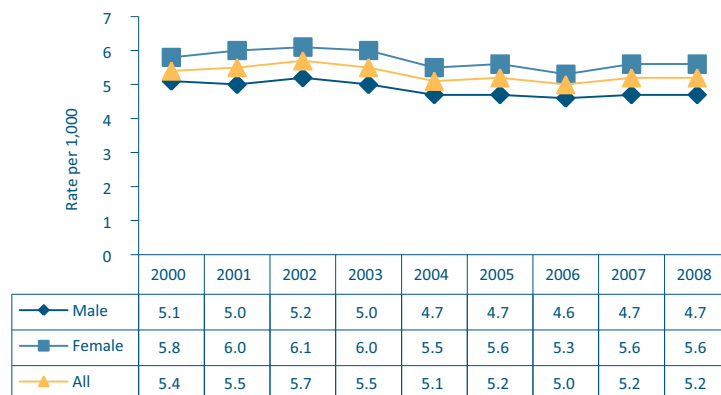
What is the trend in annual asthma ED visit rates?

Asthma ED data for the most recent nine years available are shown in Figure 8. There has been a statistically significant decline in asthma ED visit rates for males, females and all Missourians for this time period ($p < 0.05$).

What is the trend in annual asthma ED visit rates by gender?

Although for both males and females there have been significant declines in asthma ED visit rates for 2000 to 2008 (Figure 8), the rates were significantly higher for females than males with all ages combined.

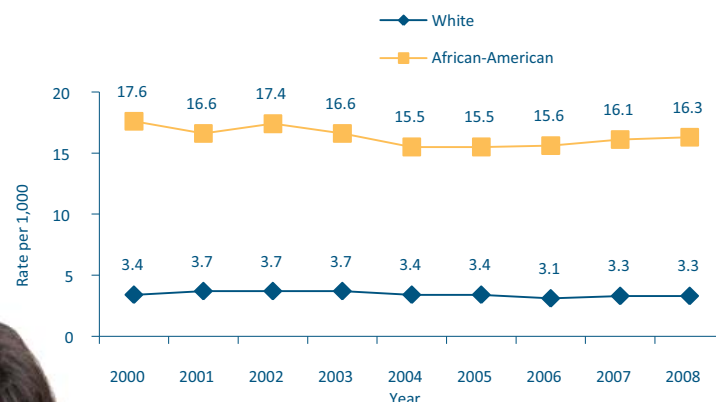
Figure 8. Age-adjusted rates of asthma emergency department visits by year and gender, Missouri, 2000-2008



What is the trend in annual asthma ED visit rates by race?

Figure 9 shows that ED visit rates decreased over time for whites and African-Americans, but these decreases, albeit close ($p = 0.05$), were not statistically significant. There was more variation in ED rates among African-Americans; however, the rates were consistently significantly higher for African-Americans than whites.

Figure 9. Age-adjusted rates of asthma emergency department visits by year and race, Missouri, 2000-2008



How do Missouri asthma ED visit rates compare to national rates?

According to 2007 data, the crude asthma ED visit rate for the U.S. was 3.9 per 1,000 people.¹³ Missouri's crude ED rate was 5.0 per 1,000 in 2007; however, an age-adjusted rate was not available, so statistical significance could not be determined.

How do Missouri asthma ED visit rates compare to the Healthy People 2020 objectives?

As Table 12 shows, the 2008 Missouri ED rate for those younger than age 5 will need to decrease by 23.4 percent to reach the Healthy People (HP) 2020 objective for that age group.^{14,15} The Missouri ED rate for those 5 to 64 years of age is near the HP 2020 objective, requiring a 1.2 percent decline to achieve the objective. The rate for those 65 and older is also close to the HP objective, but will require a 3.6 percent reduction to reach the HP 2020 objective.

INPATIENT HOSPITALIZATIONS

How many inpatient hospitalizations occur each year due to asthma?

In 2008, there were 8,239 inpatient hospitalizations with asthma as the primary diagnosis.¹⁶ Table 13 shows asthma hospitalization data by gender and race. The age-adjusted asthma hospitalization rate for all Missouri residents was 13.8 per 10,000 population.

What groups are hospitalized due to asthma the most?

Age-adjusted asthma hospitalization rates were statistically significantly higher among females than males. For both genders, rates were higher for African-Americans than whites (Table 13). African-American male hospitalization rates were higher than white male rates and African-American female hospitalization rates were higher than white female rates. All differences by race and gender were statistically significant.

Table 12. Healthy People 2020 national target objectives for asthma emergency department visits by age-specific rates per 10,000 population,* Missouri and U.S.

	Age Group	Baseline		Progress		Healthy People 2020 Objective 2020
		U.S.	Missouri	U.S.	Missouri	
		1995 -1997	2001	2005 -2007	2008	
Emergency department visits due to asthma	Children less than age 5	150.0	153.8	132.7	124.7	95.5
	Children and adults age 5 - 64 years	71.1	53.3	56.4	49.7	49.1
	Adults aged 65 years and older	29.5	13.7	21.0	13.7	13.2

*Rates per 10,000 in accordance with Healthy People 2020 National Target Objectives.

Table 13. Age-adjusted rates for asthma hospitalizations by race and gender, rates per 10,000 population, Missouri, 2008

Race	Number	Males		Number	Females		Both Genders		
		Rate	95% CI		Rate	95% CI	Number	Rate	95% CI
White	1,691	6.9	6.5 - 7.2	3,180	11.5	11.1 - 11.9	4,871	9.3	9.0 - 9.6
African - American	1,348	36.6	34.6 - 38.7	1,708	46.2	44.0 - 48.5	3,056	42.6	41.0 - 44.1
All Races	3,201	11.1	10.8 - 11.5	5,038	16.1	15.7 - 16.6	8,239	13.8	13.5 - 14.1

Age-adjustment uses 2000 standard population.

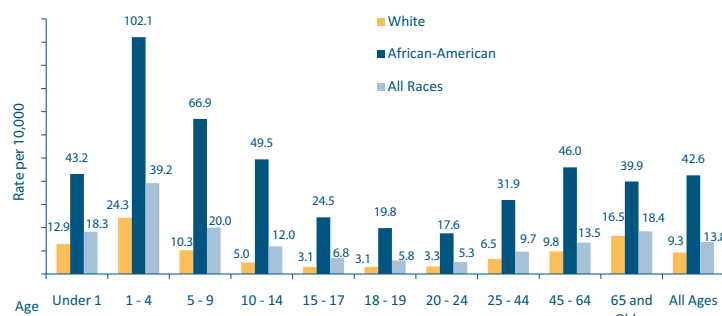
Which age groups are hospitalized the most due to asthma?

Figure 10 shows that in 2008 hospitalization rates were highest among children one to four years of age, followed by those five to nine years old. Rates were lowest among those 15 to 44, and were elevated for those 45 years of age and older.

How do asthma hospitalization rates vary by race and age?

Figure 10 shows that rates were higher for African-Americans than whites in all age categories. All of these differences were statistically significant.

Figure 10. Asthma hospitalization rates by race and age group, Missouri, 2008, males and females



What is the extent of the racial disparity in asthma hospitalizations?

Table 14 shows that rate ratios were especially high among those 5 to 19 years of age. The lowest rate ratio was among those 65 and older, who were at 2.4 times greater risk of being hospitalized due to asthma than whites of the same age.

Among males, which age groups are hospitalized the most due to asthma?

Asthma hospitalization rates were highest for males under 15 years old, especially those under 5 years of age (Figure 11). Rates were also elevated among those 65 years and older.

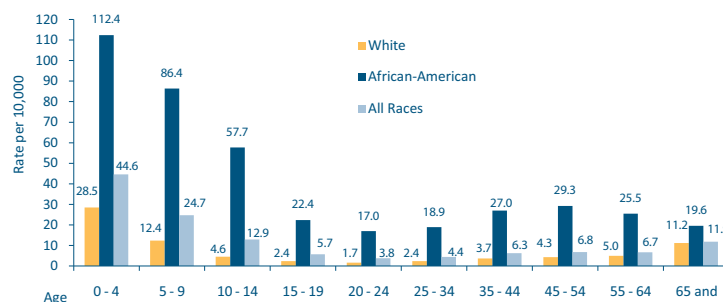
Among males, how do asthma hospitalization rates vary by race and age?

Figure 11 shows that rates were higher for African-American males than white males in all age categories. All of these differences were statistically significant.

Table 14. Asthma hospitalization rate ratio for African-Americans compared to whites by age group, Missouri, 2008, males and females

Age in Years	Rate Ratio
0 to 4	4.1
5 to 9	6.5
10 to 14	9.9
15 to 19	7.3
20 to 24	5.3
25 to 34	4.8
35 to 44	5.0
45 to 54	5.2
55 to 64	4.1
65 and older	2.4

Figure 11. Asthma hospitalization rates by race and age group, Missouri, 2008, males



Among males, what is the extent of the racial disparity in asthma hospitalizations?

Rate ratios were high for many age categories, but were especially high for those 10 to 24 years of age. The lowest rate ratio was among those 65 and older (Table 15).

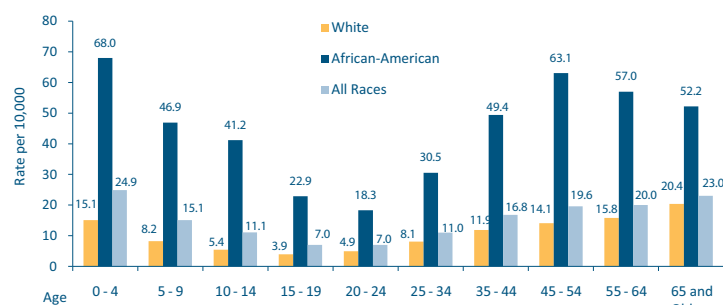
Table 15. Asthma hospitalization rate ratio for African-Americans compared to whites by age group, Missouri, 2008, males

Age in Years	Rate Ratio
0 to 4	3.9
5 to 9	7.0
10 to 14	12.5
15 to 19	9.5
20 to 24	10.0
25 to 34	7.9
35 to 44	7.3
45 to 54	6.8
55 to 64	5.1
65 and older	1.8

Among females, which age groups are hospitalized the most due to asthma?

The highest asthma hospitalization rate among females was in those younger than age five (Figure 12). Rates begin to decline at age 5 through 24, when at 25 they begin to increase and remain elevated.

Figure 12. Asthma hospitalization rates by race and age group, Missouri, 2008, females



Among females, how do asthma hospitalization rates vary by race and age?

Figure 12 shows that rates were higher for African-American females than white females in all age categories. All of these differences were statistically significant.

Among females, what is the extent of the racial disparity in asthma hospitalizations?

Table 16 shows the extent of the racial disparity in asthma hospitalizations among females. This disparity was greatest among those 10 to 14 years of age and lowest among those 65 and older.

Table 16. Asthma hospitalization rate ratio for African-Americans compared to whites by age group, Missouri, 2008, females

Age in Years	Rate Ratio
0 to 4	4.5
5 to 9	5.7
10 to 14	7.6
15 to 19	5.9
20 to 24	3.7
25 to 34	3.8
35 to 44	4.2
45 to 54	4.5
55 to 64	3.6
65 and older	2.6

How does the racial disparity in asthma hospitalizations differ among males and females?

When Tables 15 and 16 are compared, rate ratios were higher for African-American males in all age groups with the exceptions of children younger than age five and those 65 and older. For African-Americans, the highest rate ratios were among males 10 to 24 years of age compared to females whose highest rate ratios were among those 5 to 19 years of age.

How do male and female asthma hospitalization rates compare by age?

Figures 11 and 12, show that age-specific rates differed for males and females. Rates were significantly higher for males than females in age groups younger than 10 years of age. Rates were not significantly different for those 10 to 19 years old. For those 20 and older, asthma hospitalization rates were significantly higher for females than males.

What payment sources cover asthma hospitalizations in Missouri?

Figure 13 shows that the most common payment source for asthma hospitalizations was Medicaid, followed by Medicare and commercial health insurance. Slightly over 9 percent were self-pay or no charge.

It is important to note that the “all other” category in this section includes other government payment sources, worker’s compensation, “other” payment sources and unknowns.

Figure 13. Asthma hospitalization rates by expected payment source, Missouri, 2008

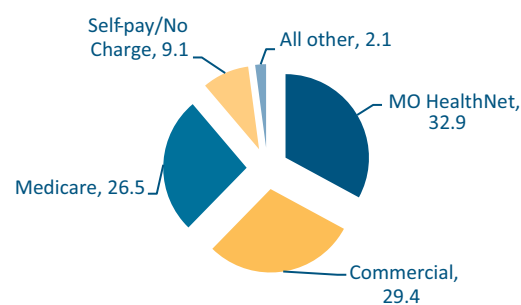
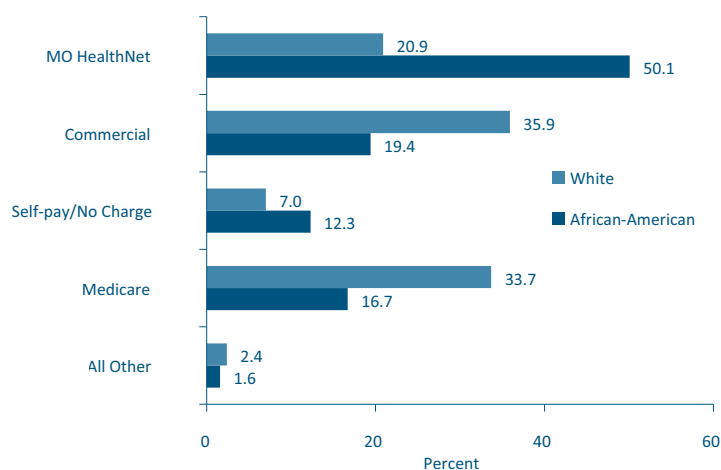


Figure 14. Percent of asthma hospitalization rates by expected payment source and race, Missouri, 2008



How do asthma hospitalization payment source proportions vary by race?

Figure 14 shows that the most common payment source for asthma hospitalizations among whites was commercial health insurance. The most common payment source for African-American asthma hospitalizations was Mo HealthNet (about 50%). Commercial health insurance was the second most common payment source, but covered only 19.4 percent of African-American asthma hospitalizations. Medicare covered only 16.7 percent, much less than the proportion observed among white asthma hospitalizations (33.7%). Twelve percent of African-American asthma hospitalizations were self-pay or no charge, slightly higher than the proportion observed for white asthma hospitalizations (7%).

How do asthma hospitalizations payment source proportions vary by age?

Figure 15 provides asthma hospitalization proportions by payment source for children less than 18 years and adults 18 to 64 years. It is important to note that for individuals 65 and older, Medicare covered 93.1 percent of the asthma hospitalizations for this age group.

The most common payment source for asthma hospitalizations among children was Medicaid (62.4%) with commercial payment sources covering about one-third (32.2%) of the visits. Less than 3 percent of asthma hospitalizations among children were self-pay or no charge compared to 17 percent for adults age 18 to 64 years. The

most common payment source for adults age 18 to 64 years was commercial health insurance. Medicare covered about 20 percent of the hospitalizations for the 18 to 64 age category.

Figure 15. Percent of asthma hospitalization rates by expected payment source and age group, Missouri, 2008

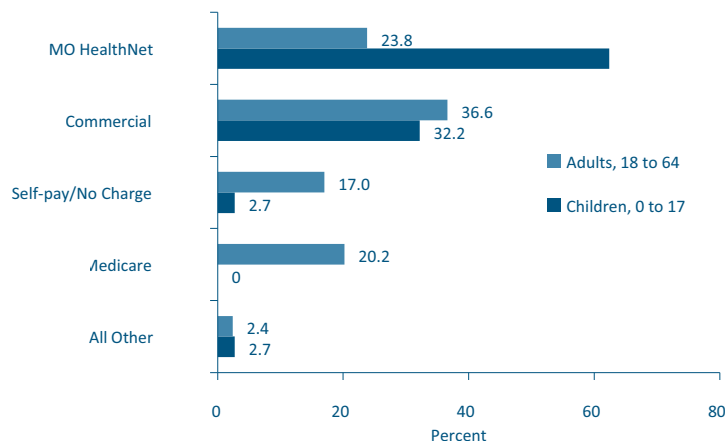
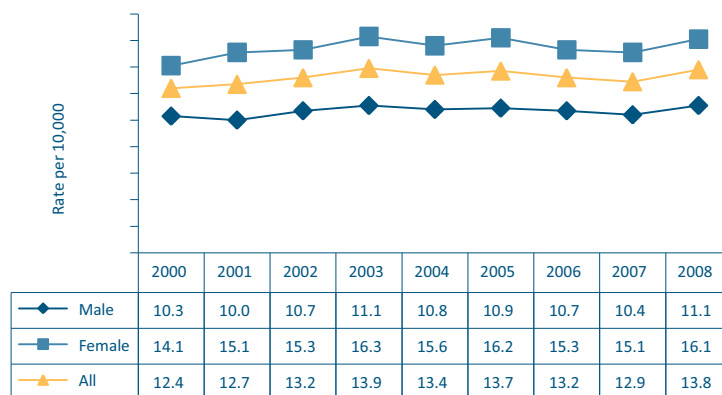


Figure 16. Age-adjusted rates of hospitalizations by year and gender, Missouri, 2000-2008



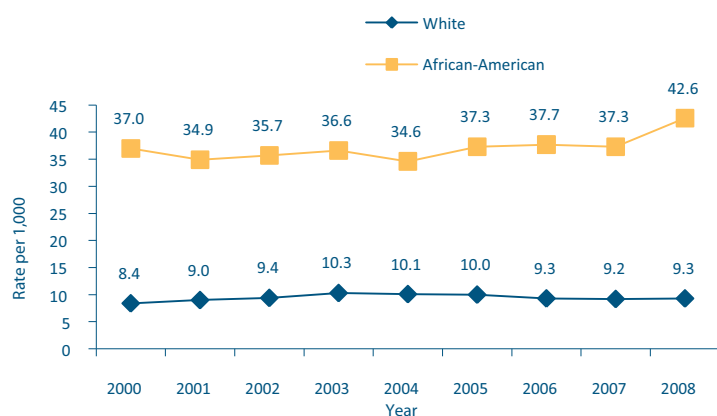
What is the trend in annual asthma hospitalization rates?

Asthma hospitalization data for the most recent nine years available are shown in Figure 16. The asthma hospitalization rates observed increase over this time period for males, females and all Missourians but were not statistically significant.

What is the trend in annual asthma hospitalization rates by race?

Figure 17 shows that there was a slight increase in hospitalization rates among whites, but this was not statistically significant. Among African-Americans, however, the increase in asthma hospitalizations observed during the period 2000 to 2008 was statistically significant ($p < 0.05$).

Figure 17. Age-adjusted rates for asthma hospitalizations by year and race, Missouri, 2000-2008



How do Missouri asthma hospitalization rates compare to national rates?

According to 2007 data, the age-adjusted rate for hospitalizations due to asthma in the United States was 15.2 per 10,000.¹⁷ This was higher than the 2008 rate observed in Missouri, 13.8 per 10,000, but not statistically significant.

How do Missouri asthma hospitalization rates compare to the Healthy People 2020 objectives?

As Table 17 shows, the 2008 Missouri hospitalization rate for those under age 5 would need to decline about 48.3 percent to achieve the HP 2020 objective for that age group.¹⁴ The hospitalization rates for those 5 to 64 years would need to decline about 23.9 percent to achieve the HP 2020 objective for that age group. For those 65 and older, the Missouri rate was less than the HP 2020 target.

Table 17. Healthy People 2020 National Target Objectives for asthma hospitalizations by age-specific rates per 10,000 population, Missouri and the U.S.

Age Group	Baseline		Progress		Healthy People 2020 Objective
	National 1998	Missouri 2001	National 2007	Missouri 2008	
Children less than age 5	45.6	38.4	41.4	35.0	18.1
Children and adults age 5 - 64 years	12.5	12.6	11.1	11.3	8.6
Adults aged 65 years and older	17.7	11.1	25.3	18.4*	20.3

*Objective met.



What is the trend in annual days of hospital care due to asthma?

Figure 18 shows that there was an overall increase in annual days of hospital care due to asthma during the period 2000 through 2008. This trend was statistically significant.

What is the trend in annual days of hospital care due to asthma by gender

Figure 18 shows that there was an increase in days of hospital care in both males and females, and these increases were statistically significant. It is important to note that the number of hospitalizations was higher among females each year.

What is the trend in annual days of hospital care due to asthma by race?

Figure 19 shows that there was an increase in days of hospital care due to asthma among whites and African-Americans. This trend was significant among both African-Americans and whites. The number of days of care for asthma hospitalizations each year among whites is about double that of African-Americans.

What is the total amount of hospitalization charges due to asthma?

In 2008, \$96.0 million in hospitalization charges were attributed to asthma (Figure 20).

How do hospitalization charges due to asthma vary by gender and race?

Figure 20 shows that overall asthma hospitalization charges were greater among females than males. This was true for both African-Americans and whites. African-Americans accounted for 35.1 percent of all asthma hospitalization charges, but made up only 11.9 percent of the population in 2008. The higher number of asthma hospitalizations among females than males is the most likely reason for the difference in total asthma hospitalization charges observed between males and females. Similarly, the higher number of asthma hospitalizations among whites than African-Americans is the most likely reason for the difference observed between whites and African-Americans.

Figure 18. Total days of hospital care due to asthma by year and gender, Missouri, 2000-2008

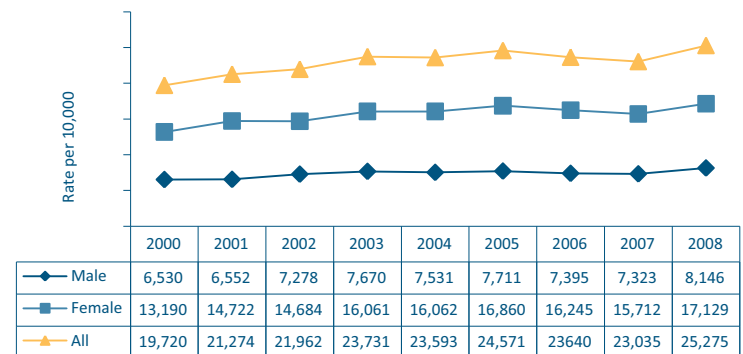


Figure 19. Total days of hospital care due to asthma by year and race, Missouri, 2000-2008

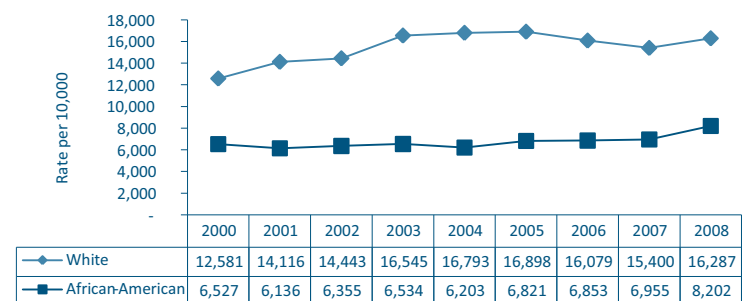
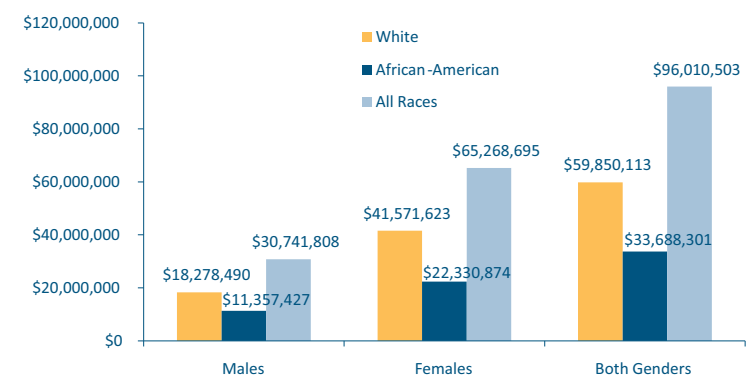


Figure 20. Total asthma hospitalization charges by gender and race, Missouri, 2008



What is the trend in asthma hospitalization charges?

During the period 2000-2008, asthma hospitalization charges increased by 121 percent — from \$43.4 million in 2000 to \$96.0 million in 2008. While the percent increase for all consumer items during this time period was 25.0 percent, the medical care services, which includes hospital services, increased by 44.7 percent.¹⁸ This may explain a portion of the increase in charges observed along with the overall increase in asthma-related hospital days of care during the 9-year period.

DEATHS

How many deaths occur each year due to asthma?

In 2009, asthma was the underlying cause of death in 81 individuals. The age-adjusted mortality, or death, rate was 1.3 per 100,000. Seven of those that died due to asthma were children younger than age 15. Table 18 shows that the total number of deaths due to asthma during the period 1999-2009 was 864. This is an average of 79 deaths per year.

How many years of potential life lost are due to asthma?

Although all asthma deaths are preventable, deaths in individuals below 75 years of age are considered “premature.” During the period 1999-2009, premature asthma deaths led to an average of 1,595 years of life lost per year.

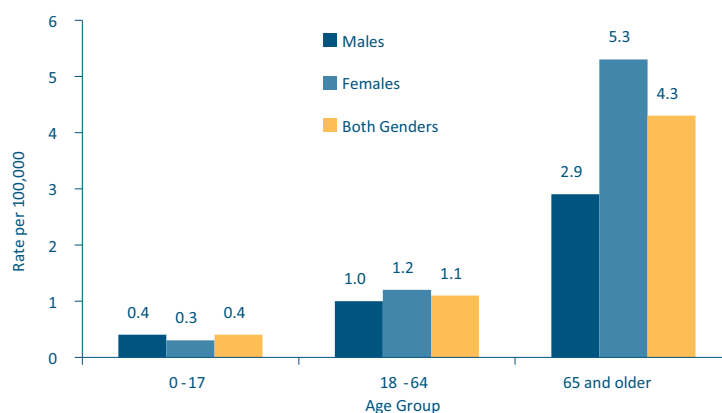
Which groups are most likely to die due to asthma?

Table 18 shows that age-adjusted asthma mortality rates during the period 1999-2009 were significantly higher among females than males. Rates were also significantly higher among African-Americans than whites.

Which age groups are most likely to die due to asthma?

As Figure 21 shows, asthma death rates increase with age. Deaths due to asthma are rare among children, with 56 occurring during the period 1999-2009 or an average of five per year. During the same time period, 808 adults died due to asthma.

Figure 21. Age-specific mortality rates by age-group and gender, Missouri, 1999-2009



How do asthma mortality rates vary by sex and age?

Overall, mortality rates were significantly higher among females than males. Rates were significantly higher among males 18 to 64 compared to males younger than age 18, Female mortality rates compared to males were higher among those 65 years and older, and this difference was statistically significant.

Table 18. Age-adjusted asthma mortality rates by race and gender, Missouri, 1999-2009, rates per 100,000 population

Race	Number	Males		Number	Females		Number	Both Genders	
		Rate	95% CI		Rate	95% CI		Rate	95% CI
White	212	0.8	0.7 - 0.9	410	1.2	1.1 - 1.3	622	1.0	1.0 - 1.1
African-American	111	3.6	2.9 - 4.4	125	3.4	2.8 - 4.0	236	3.5	3.1 - 4.0
All Races	327	1.1	1.0 - 1.2	537	1.4	1.3 - 1.6	864	1.3	1.2 - 1.4

See Appendix E for Missouri Vital Statistics Information.
Age-adjustment uses 2000 standard population.

What is the extent of the variation by sex in asthma mortality?

Table 19 shows the rate ratio was highest among females age 65 and older, with a 50 percent higher risk of dying from asthma than males in this age group. Females 18 to 64 were at 1.3 times increased risk of dying due to asthma than males of the same age. However, male children were at a 30 percent increased risk of dying due to asthma than female children.

Table 19. Total days of hospital care due to asthma by year and race, Missouri, 2000-2008

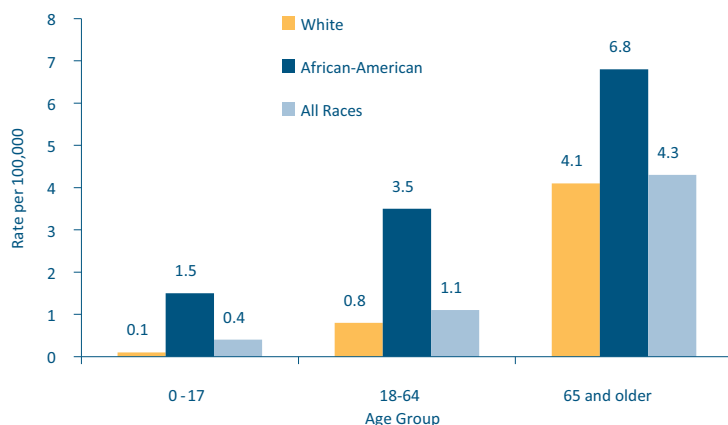
Age in Years	Rate Ratio
0 to 17	0.7
18 to 64	1.3
65 and older	1.5

How do asthma mortality rates vary by race and age?

As Figure 22 shows, asthma mortality rates were higher among African-Americans in all age categories. These differences were all statistically significant.

It is important to note that fewer than 20 deaths were reported among whites younger than age 18 years during this time period, so results for this group should be interpreted with caution.

Figure 22. Age-specific mortality rates by race and age group, Missouri, 1999-2009



What is the extent of the racial disparity in asthma mortality?

Table 20 shows that African-Americans were at 1.7 to 11.0 times increased risk of dying due to asthma than whites of the same age group. The highest rate ratio was for African-American children, who had an 11-fold increased death rate over white children.

Table 20. Asthma mortality rate ratio for African-Americans compared to whites by age group, Missouri, 1999-2009, all races

Age in Years	Rate Ratio
0 to 17	11.0 [^]
18 to 64	4.3
65 and older	1.7

[^]Results should be interpreted with caution due to the low number of asthma deaths among whites 17 and younger. Rate ratio is 11.0 due to rounding of rates.

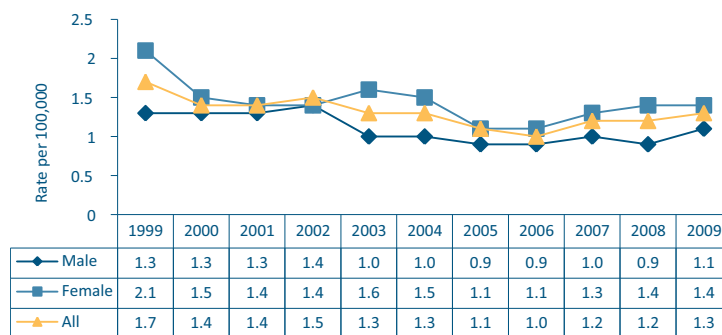
What is the trend in asthma deaths?

A statistically significant decrease in the overall asthma death rates was observed between 1999 and 2009 (Figure 23).

How does the trend in asthma deaths vary by gender?

Figure 23 shows that death rates decreased for both males and females during the period 1999-2009, but the trend was statistically significant for males but not females.

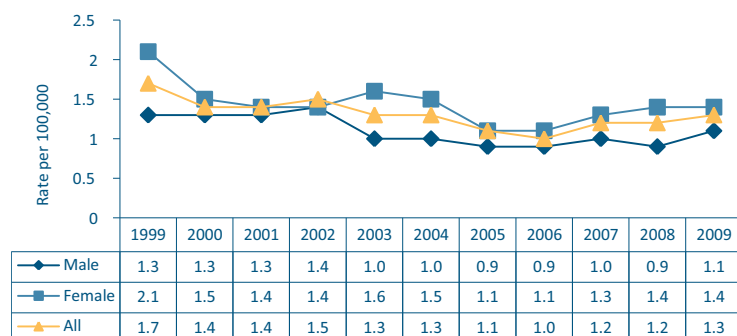
Figure 23. Age-adjusted asthma mortality rates by gender and year, Missouri, 1999-2009



How does the trend in asthma deaths vary by race?

Rates decreased for both whites and African-Americans during the period 1999-2009 (Figure 24), but the trend was only statistically significant for whites during this timeframe.

Figure 24. Age-adjusted asthma mortality rates by race and year, Missouri, 1999-2009



Premature asthma deaths led to an average of 1,595 years of life lost per year (2000-2009).

How do Missouri asthma mortality rates compare to national rates?

In 2002, the national asthma death rate was 1.5 per 100,000,¹⁹ the same as the Missouri rate in that year.

How do Missouri asthma death rates compare to the Healthy People 2010 objectives?

In 2004, there were too few asthma deaths to calculate rates on the three youngest age categories (Table 21). In the age groups that include those 35 to 64 years old, the state asthma death rate was higher than the HP 2010 objective. The mortality rate in the 65 years and older age group was lower than the HP 2010 target.

Table 21. Healthy People 2020 national target objectives for asthma mortality by age-specific rates per 1,000,000 population, Missouri and U.S.

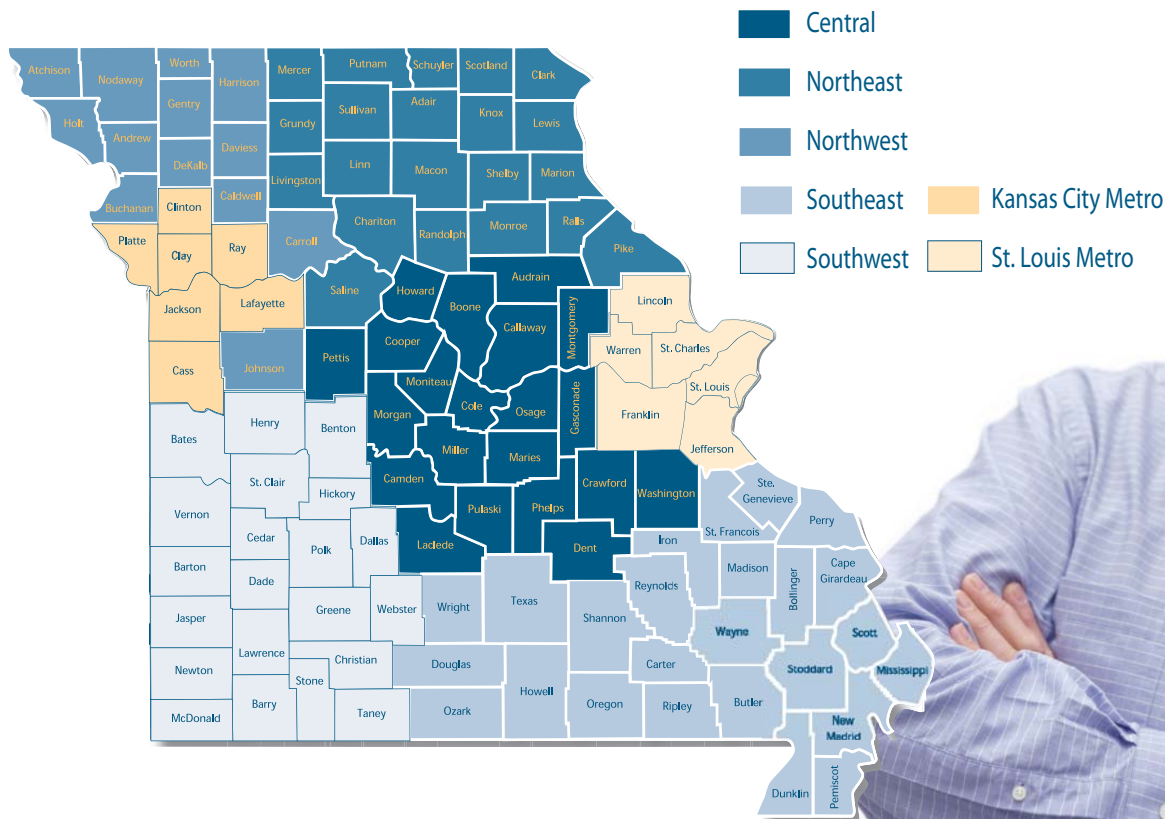
Age Group	Baseline		Healthy People 2020 Objective
	U.S. 2007	Missouri 2007-2009	
Children and adults younger than age 35	3.4	5.7	[^]
Adults age 35 to 64 years	11.0	13.1	6.0
Adults aged 65 years and older	43.3	36.6	22.9

[^]Measure is being tracked for informational purposes. If warranted, a target will be set during the decade.

Missouri Data by BRFSS Region

About this Section

This section aims to describe the burden of asthma in the seven BRFSS regions shown below and to compare these findings to Missouri as a whole. Several sources of information are used to describe the burden of asthma including the Missouri Behavioral Risk Factor Surveillance System (BRFSS) and the Missouri Information for Community Assessment (MICA) System and other sources. Statistics displayed in this report may be slightly different from that found in the current MICA due to revisions in the population estimates. Data are reported by residence of the individual. For additional information see the appendices.



Central

Asthma Fact Sheet: 2008-2009

PREVALENCE

- Based on prevalence estimates, approximately 46,000 adults and 8,900 children younger than age 18 are currently living with asthma in the central region.
- Current asthma prevalence among adults living in the central region was 8.5 percent (95% CI 4.8 - 12.3), compared to 9.5 percent (95% CI 8.1 - 10.9) for all adults in Missouri.
- Current asthma prevalence among children was 5.5 percent (95% CI 1.7 - 9.3), compared to 10.1 percent (95% CI 7.8 - 12.4) for all children living in Missouri.

ASTHMA EMERGENCY DEPARTMENT VISITS

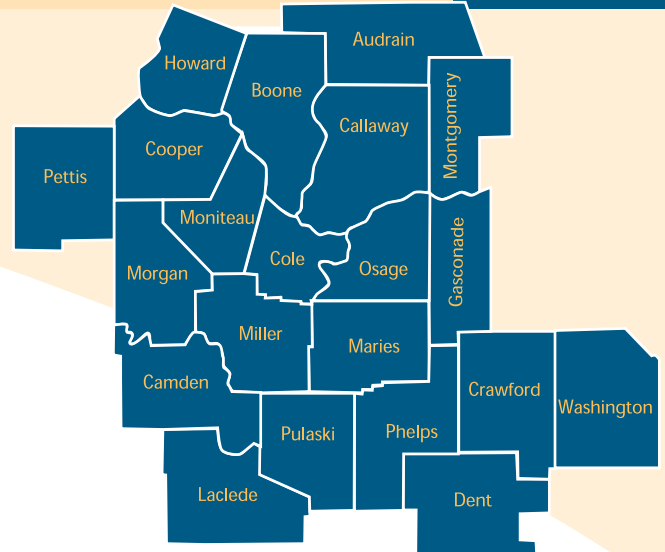
There were 2,497 emergency department (ED) visits in the central region in 2008.

- The age-adjusted asthma ED visit rate was 3.7 per 1,000 persons, which was significantly lower than the state rate (5.2 per 1,000). See Table 22 for ED visit rates by county.
- Children 17 and younger accounted for 34.1 percent of all asthma ED visits in this region compared to 42.6 percent for the state as a whole.
- African-Americans made up 5.6 percent of the region's total population, but accounted for 20.1 percent of all asthma ED visits. Boone, Cole and Pulaski counties have 70 percent of the total African-American population within the region.
- ED visit rates were significantly higher among females (4.3%, 95% CI 4.0 - 4.5) than males (3.1%, 95% CI 2.9 - 3.3).

ASTHMA HOSPITALIZATIONS

There were 740 hospitalizations in the central region in 2008.

- The age-adjusted asthma hospitalization rate was 10.5 per 10,000 (95% CI 9.8 - 11.3), which was significantly lower than the state rate (13.8 per 10,000; 95% CI 13.5 - 14.1).
- This region accounted for 9.0 percent of Missouri's total asthma hospitalizations.
- Children accounted for 23.0 percent of all asthma hospitalizations in this region compared to 34.3 percent for the state as a whole.
- African-Americans accounted for 14.9 percent of the asthma hospitalizations in the region compared to 37.1 percent for the state as a whole.
- Asthma led to 2,740 days of hospital care with an average of 3.7 days per hospitalization.



- Charges totaled nearly \$9.6 million for asthma hospitalizations for individuals living in this region.

DATA SOURCES

PREVALENCE DATA: Missouri Department of Health and Senior Services. Missouri Behavioral Risk Factor Surveillance System, 2008 and 2009. Available at: <http://health.mo.gov/data/brfss/index.php>

EMERGENCY DEPARTMENT AND HOSPITALIZATION DATA: Missouri Department of Health and Senior Services, Bureau of Health Informatics. Missouri Information for Community Assessment (MICA). Available at: <http://health.mo.gov/data/mica/EmergencyRoomMICA>

POPULATION DATA: Missouri Census Data Center. 2008 Population Estimates for Missouri and the United States. Available at: <http://mcdc2.missouri.edu/trends/estimates.shtml> and Missouri Department of Health and Senior Services. Population MICA. Available at: <http://health.mo.gov/data/mica/PopulationMICA>

Table 22. Age-adjusted asthma emergency department visit rates by county, central region, Missouri, 2008

County ^	Rate per		County ^	Rate per	
	1,000	95% CI		1,000	95% CI
Audrain	5.1	4.3 - 6.1	Miller	3.7	3.0 - 4.6
Boone	4.2	3.9 - 4.6	Moniteau	2.4	1.6 - 3.3
Callaway	4.0	3.5 - 4.7	Montgomery	3.2	2.2 - 4.6
Camden	5.2	4.4 - 6.0	Morgan	2.6	1.9 - 3.5
Cole	4.5	4.0 - 5.0	Osage	--	--
Cooper	5.4	4.3 - 6.6	Pettis	4.4	3.8 - 5.1
Crawford	3.9	3.2 - 4.9	Phelps	2.7	2.2 - 3.3
Dent	6.3	5.0 - 7.8	Pulaski	1.4	1.1 - 1.9
Gasconade	1.9	1.3 - 2.9	Washington	3.8	3.1 - 4.7
Howard	2.8	1.8 - 4.2	Region	3.7	3.5 - 3.8
Laclede	3.0	2.4 - 3.6	State	5.2	5.1 - 5.2
Maries	--	--			

^No county rate significantly higher than the state rate within this region.

-- Fewer than 20 visits; rate considered unreliable and confidence interval not calculated.

Note: Emergency department rates have been age adjusted based on the U.S. 2000 standard population; county and regional data are reported by patient residence.

Northeast

Asthma Fact Sheet: 2008-2009

PREVALENCE

- Based on prevalence estimates, approximately 22,000 adults and 1,800 children younger than age 18 in the northeast region are currently living with asthma.
- Although not significantly higher, the current asthma prevalence among adults living in the northeast region was 11.7 percent (96% CI 5.8 - 17.7), compared to 9.5 percent (95% CI 8.1 - 10.9) for adults in the entire state.
- Current asthma prevalence was significantly lower among children at 3.2 percent (95% CI 0.5 - 5.9) in the northeast region, compared to 10.1 percent (95% CI 7.8 - 12.4) for all children in Missouri.

ASTHMA EMERGENCY DEPARTMENT VISITS

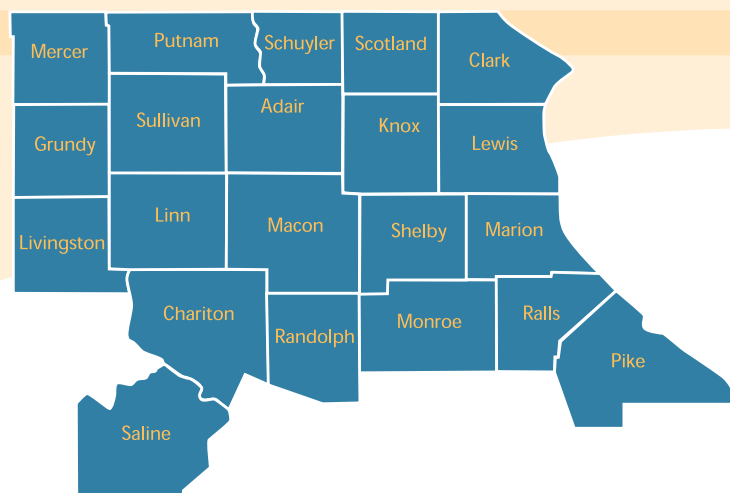
There were 803 emergency department (ED) visits in the northeast region in 2008.

- The age-adjusted asthma ED visit rate was 3.4 per 1,000 persons, which was significantly lower than the state rate (5.2 per 1,000). See Table 23 for ED visit rates by county.
- Children age 17 and younger accounted for 33.3 percent of all asthma ED visits in this region, compared to 42.6 percent for the state as a whole.
- African-Americans made up 3.4 percent of the region's population, but accounted for 6.5 percent of all asthma ED visits.
- ED visit rates were significantly higher among females than males (4.3 [95% CI 3.9 - 4.7] versus 2.6 [95% CI 2.3 - 2.9] per 1,000).

ASTHMA HOSPITALIZATION RATES

There were 296 hospitalizations in the northeast region in 2008.

- The age-adjusted asthma hospitalization rate was 11.4 per 10,000 (95% CI 10.1 - 12.8), which was significantly lower from the state rate (13.8 per 10,000; 95% CI 13.5 - 14.1).
- This region accounted for 3.6 percent of Missouri's total asthma hospitalizations.
- Children accounted for 25.3 percent of all asthma hospitalizations in this region, compared to 42.6 percent for the state as a whole.
- African-Americans made up only 3.4 percent of the region's population, but accounted for 6.1 percent of all asthma hospitalizations.



- Asthma led to 934 days of hospital care with an average of 3.2 days per hospitalization.
- Charges totaled \$2.9 million for asthma hospitalizations.

DATA SOURCES

PREVALENCE DATA: Missouri Department of Health and Senior Services. Missouri Behavioral Risk Factor Surveillance System, 2008 and 2009. Available at: <http://health.mo.gov/data/brfss/index.php>

EMERGENCY DEPARTMENT AND HOSPITALIZATION DATA: Missouri Department of Health and Senior Services, Bureau of Health Informatics. Missouri Information for Community Assessment (MICA). Available at: <http://health.mo.gov/data/mica/EmergencyRoomMICA>

POPULATION DATA: Missouri Census Data Center. 2008 Population Estimates for Missouri and the United States. Available at: <http://mcdc2.missouri.edu/trends/estimates.shtml> and Missouri Department of Health and Senior Services. Population MICA. Available at: <http://health.mo.gov/data/mica/PopulationMICA>

Table 23. Age-adjusted asthma emergency department visit rates by county, northeast region, Missouri, 2008

County	Rate per		County	Rate per	
	1,000	95% CI		1,000	95% CI
Adair	2.1	1.5 - 2.9	Pike	3.4	2.6 - 4.3
Chariton	--	--	Putnam	--	--
Clark	--	--	Ralls	2.4	1.4 - 3.7
Grundy	6.1	4.6 - 8.0	Randolph	3.0	2.4 - 3.8
Knox	--	--	Saline	4.7	3.8 - 5.7
Lewis	--	--	Schuyler	--	--
Linn	4.2	3.1 - 5.6	Scotland	--	--
Livingston	7.7*	6.3 - 9.4	Shelby	--	--
Macon	2.4	1.6 - 3.4	Sullivan	6.1	4.3 - 8.4
Marion	4.4	3.7 - 5.3	Region	3.4	3.2 - 3.7
Mercer	--	--	State	5.2	5.1 - 5.2
Monroe	2.8	1.7 - 4.2			

*Rate significantly higher than the state rate.

-- Fewer than 20 visits; rate considered unreliable and confidence interval not calculated.

Note: Emergency department rates have been age adjusted based on the U.S. 2000 standard population; county and regional data are reported by patient residence.

Northwest

Asthma Fact Sheet: 2008-2009

PREVALENCE

- Based on prevalence estimates, more than 16,000 adults and about 4,600 children younger than age 18 in the northwest region are currently living with asthma.
- Current asthma prevalence among adults living in the northwest region was 8.7 percent (95% CI 5.8 - 11.6), compared to 9.5 percent (95% CI 8.1 - 10.9) for adults in the entire state.
- Current asthma prevalence among children was 8.3 percent (95% CI 3.6 - 13.0), compared to 10.1 percent (95% CI 7.8 - 12.4) for all children living in Missouri.

ASTHMA EMERGENCY DEPARTMENT VISITS

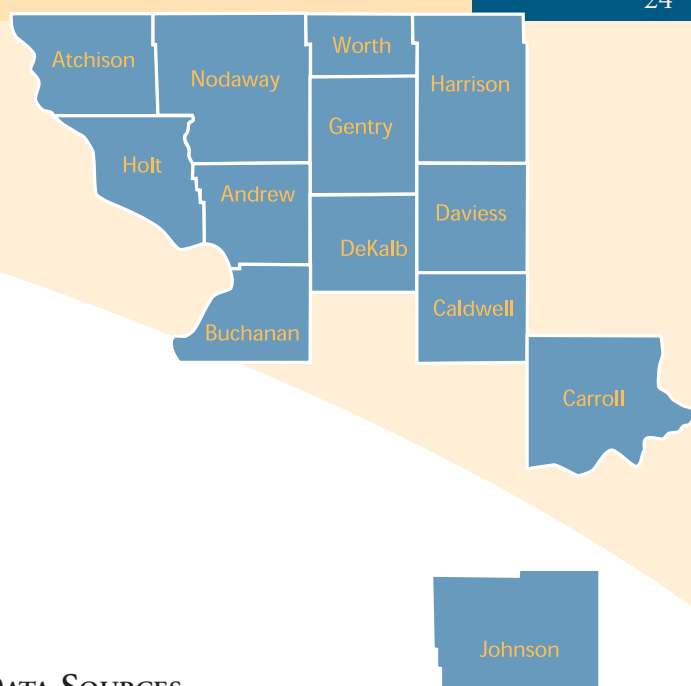
There were 926 emergency department (ED) visits in the northwest region in 2008.

- The age-adjusted asthma ED visit rate was 3.9 per 1,000 persons, which was significantly lower than the state rate (5.2 per 1,000). See Table 24 for ED visit rates by county.
- Children accounted for 32.1 percent of all asthma ED visits in this region, compared to 42.6 percent for the state as a whole.
- African-Americans made up 3.4 percent of the region's population, but accounted for 8.3 percent of all asthma ED visits
- ED visit rates were significantly higher among females than males (4.8 [95% CI 4.4 - 5.2] versus 3.1 [95% CI 2.8 - 3.5] per 1,000).

ASTHMA HOSPITALIZATION RATES

There were 347 hospitalizations in the northwest region in 2008.

- The age-adjusted asthma hospitalization rate was 14.0 per 10,000 (95% CI 12.6 - 15.6), which was not significantly different than the state rate (13.8 per 10,000; 95% CI 13.5 - 14.1).
- Children accounted for 24.2 percent of all asthma hospitalizations in this region, compared to 34.3 percent for the state as a whole.
- African-Americans made up 3.4 percent of the region's population and accounted for 4.6 percent of all asthma hospitalizations.
- Asthma led to 1,132 days of hospital care with an average of 3.3 days per hospitalization.
- Charges totaled \$3.8 million for asthma hospitalizations.



DATA SOURCES

PREVALENCE DATA: Missouri Department of Health and Senior Services. Missouri Behavioral Risk Factor Surveillance System, 2008 and 2009. Available at: <http://health.mo.gov/data/brfss/index.php>

EMERGENCY DEPARTMENT AND HOSPITALIZATION DATA: Missouri Department of Health and Senior Services, Bureau of Health Informatics. Missouri Information for Community Assessment (MICA). Available at: <http://health.mo.gov/data/mica/EmergencyRoomMICA>

POPULATION DATA: Missouri Census Data Center. 2008 Population Estimates for Missouri and the United States. Available at: <http://mcdc2.missouri.edu/trends/estimates.shtml> and Missouri Department of Health and Senior Services. Population MICA. Available at: <http://health.mo.gov/data/mica/PopulationMICA>

Table 24. Age-adjusted asthma emergency department visit rates by county, northwest region, Missouri, 2008

County	Rate per 1,000	95% CI	County	Rate per 1,000	95% CI
Andrew	1.5	0.9 - 2.3	Harrison	7.1 *	5.3 - 9.3
Atchison	--	--	Holt	--	--
Buchanan	4.6	4.1 - 5.1	Johnson	3.4	2.9 - 4.0
Caldwell	4.7	3.3 - 6.5	Nodaway	3.5	2.6 - 4.4
Carroll	3.5	2.4 - 5.1	Worth	--	--
Daviess	3.7	2.4 - 5.4	Region	3.9	3.7 - 4.2
DeKalb	2.0	1.2 - 3.1	State	5.2	5.1 - 5.2
Gentry	9.4 *	6.9 - 12.5			

*Rate significantly higher than the state rate.

-- Fewer than 20 visits; rate considered unreliable and confidence interval not calculated.

Note: Emergency department rates have been age adjusted based on the U.S. 2000 standard population; county and regional data are reported by patient residence.

Southeast

Asthma Fact Sheet: 2008-2009

PREVALENCE

- Based on prevalence estimates, nearly 40,000 adults and 15,200 children younger than age 18 in the southeast region are currently living with asthma.
- Current asthma prevalence among adults living in the southeast region (9.5% [95% CI 6.4 - 12.6]) mirrored the state prevalence (9.5% [95% CI 8.1 - 10.9]).
- Current asthma prevalence among children was higher at 11.4 percent (95% CI 5.3 - 17.5), compared to 10.1 percent (95% CI 7.8 - 12.4) for the entire state, but this difference was not significant.

ASTHMA EMERGENCY DEPARTMENT VISITS

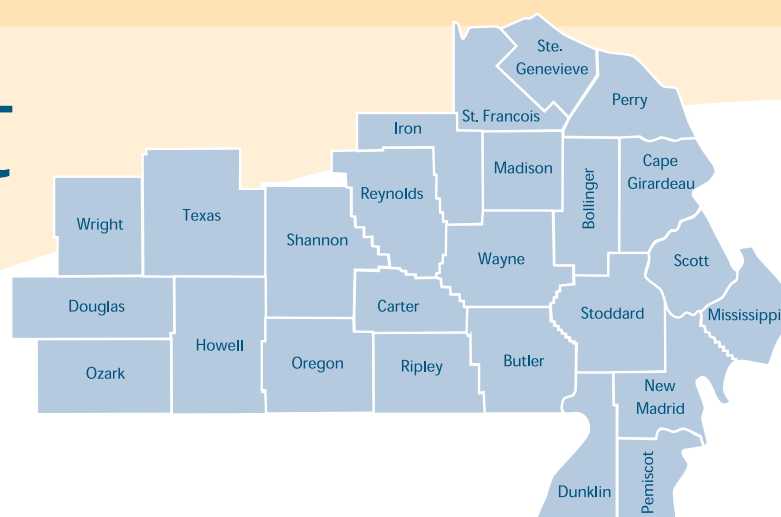
There were 1,750 emergency department (ED) visits in the southeast region in 2008.

- The age-adjusted asthma ED visit rate was 3.3 per 1,000 persons, which was significantly lower than the state rate (5.2 per 1,000). See Table 25 for ED visit rates by county.
- Children accounted for 36.1 percent of all asthma ED visits in this region, compared to 42.6 percent for the state as a whole.
- African-Americans made up 5.1 percent of the region's population, but accounted for 19.4 percent of all ED visits within this region.
- ED visit rates were significantly higher among females than males (3.8 [95% CI 3.6 - 4.1] versus 2.8 [95% CI 2.6 - 3.0] per 1,000).

ASTHMA HOSPITALIZATION RATES

There were 732 hospitalizations in the southeast region in 2008.

- The age-adjusted asthma hospitalization rate was 12.8 per 10,000 (95% CI 11.9 - 13.8), which was not significantly different than the state rate (13.8 per 10,000; 95% CI 13.5 - 14.1).
- Children accounted for 34.0 percent of all asthma hospitalizations in this region, compared to 34.3 percent for the state as a whole.
- African-Americans made up 5.1 percent of the region's population, but accounted for 15.3 percent of all asthma hospitalizations within this region.
- Asthma led to 2,159 days of hospital care with an average of 2.9 days per hospitalization.



- Charges totaled \$7.9 million for asthma hospitalizations.

DATA SOURCES

PREVALENCE DATA: Missouri Department of Health and Senior Services. Missouri Behavioral Risk Factor Surveillance System, 2008 and 2009. Available at: <http://health.mo.gov/data/brfss/index.php>

EMERGENCY DEPARTMENT AND HOSPITALIZATION DATA: Missouri Department of Health and Senior Services, Bureau of Health Informatics. Missouri Information for Community Assessment (MICA). Available at: <http://health.mo.gov/data/mica/EmergencyRoomMICA>

POPULATION DATA: Missouri Census Data Center. 2008 Population Estimates for Missouri and the United States. Available at: <http://mcdc2.missouri.edu/trends/estimates.shtml> and Missouri Department of Health and Senior Services. Population MICA. Available at: <http://health.mo.gov/data/mica/PopulationMICA>

Table 25. Age-adjusted asthma emergency department visit rates by county, southeast region, Missouri, 2008

Rate per			Rate per		
County	1,000	95% CI	County	1,000	95% CI
Bollinger	2.4	1.6 - 3.5	Perry	4.9	3.9 - 6.1
Butler	2.6	2.1 - 3.1	Reynolds	4.5	2.8 - 6.8
Cape Girardeau	2.2	1.9 - 2.6	Ripley	3.5	2.5 - 4.7
Carter	--	--	St. Francois	4.1	3.6 - 4.7
Douglas	--	--	Ste. Genevieve	2.8	2.0 - 3.8
Dunklin	4.6	3.8 - 5.4	Scott	4.6	3.9 - 5.3
Howell	3.4	2.8 - 4.1	Shannon	2.9	1.8 - 4.4
Iron	--	--	Stoddard	2.3	1.8 - 2.9
Madison	5.7	4.4 - 7.2	Texas	2.4	1.8 - 3.1
Mississippi	4.7	3.6 - 6.1	Wayne	2.6	1.7 - 3.8
New Madrid	4.1	3.2 - 5.2	Wright	2.1	1.4 - 2.9
Oregon	--	--	Region	3.3	3.2 - 3.5
Ozark	--	--	State	5.2	5.1 - 5.2
Pemiscot	7.7*	6.5 - 9.1			

*Rate significantly higher than the state rate.

-- Fewer than 20 visits; rate considered unreliable and confidence interval not calculated.

Note: Emergency department rates have been age adjusted based on the U.S. 2000 standard population; county and regional data are reported by patient residence.

Southwest

Asthma Fact Sheet: 2008-2009

PREVALENCE

- Based on prevalence estimates, nearly 71,000 adults and over 11,400 children younger than age 18 in the southwest region are currently living with asthma.
- Current asthma prevalence among adults living in the southwest region was 10.3 percent (95% CI 6.9 - 13.8), compared to 9.5 percent (95% CI 8.1 - 10.9) for adults in the entire state, but this difference was not statistically significant.
- Current asthma prevalence among children was lower at 5.3 percent (95% CI 0.8 - 9.8), compared to 10.1 percent (95% CI 7.8 - 12.4) for all children in Missouri. This difference was not statistically significant.

ASTHMA EMERGENCY DEPARTMENT VISITS

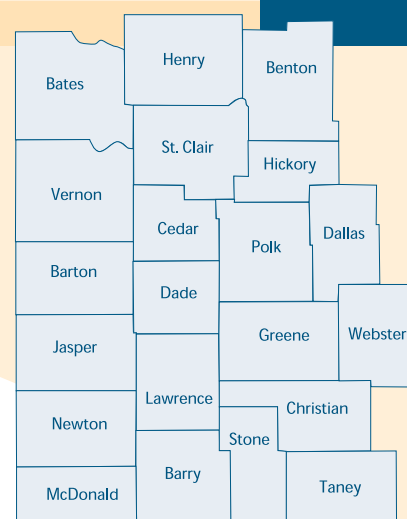
There were 3,877 emergency department (ED) visits in the southwest region in 2008.

- The age-adjusted asthma ED visit rate was 4.5 per 1,000 persons, which was significantly lower than the state rate (5.2 per 1,000). See Table 26 for ED visit rates by county.
- Children accounted for 29.8 percent of all asthma ED visits in this region, compared to 42.6 percent for the state as a whole.
- African-Americans made up 1.5 percent of the region's population, but accounted for 4.7 percent of all asthma ED visits in this region.
- ED visit rates were significantly higher among females than males (4.5 [95% CI 4.4 - 4.6] versus 3.8 [95% CI 3.6 - 4.0] per 1,000).

ASTHMA HOSPITALIZATION RATES

There were 744 hospitalizations in the southwest region in 2008.

- The age-adjusted asthma hospitalization rate was significantly lower in the southwest region (8.1 per 10,000; 95% CI 7.5 - 8.7), compared to the state rate (13.8 per 10,000; 95% CI 13.5 - 14.1).
- Children accounted for 29.8 percent of all asthma hospitalizations in this region, compared to 34.3 percent for the state as a whole.
- African-Americans made up 1.5 percent of the region's population, but accounted for 2.3 percent of all asthma hospitalizations in the region.



- Asthma led to 2,530 days of hospital care with an average of 3.4 days per hospitalization.
- Charges totaled \$8.1 million for asthma hospitalizations.

DATA SOURCES

PREVALENCE DATA: Missouri Department of Health and Senior Services. Missouri Behavioral Risk Factor Surveillance System, 2008 and 2009. Available at: <http://health.mo.gov/data/brfss/index.php>

EMERGENCY DEPARTMENT AND HOSPITALIZATION DATA: Missouri Department of Health and Senior Services, Bureau of Health Informatics. Missouri Information for Community Assessment (MICA). Available at: <http://health.mo.gov/data/mica/EmergencyRoomMICA>

POPULATION DATA: Missouri Census Data Center. 2008 Population Estimates for Missouri and the United States. Available at: <http://mcdc2.missouri.edu/trends/estimates.shtml> and Missouri Department of Health and Senior Services. Population MICA. Available at: <http://health.mo.gov/data/mica/PopulationMICA>

Table 26. Age-adjusted asthma emergency department visit rates by county, southwest region, Missouri, 2008

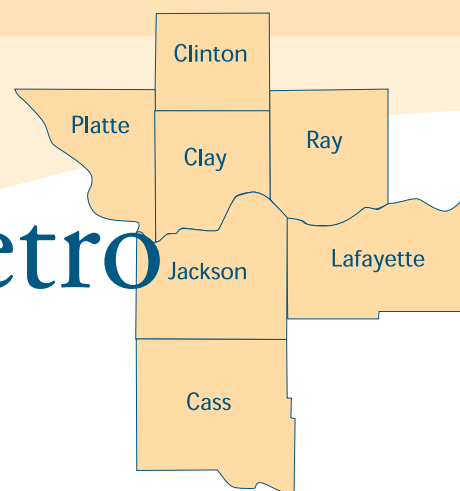
County	Rate per		County	Rate per	
	1,000	95% CI		1,000	95% CI
Barry	5.2	4.4 - 6.0	Lawrence	5.6	4.8 - 6.4
Barton	5.0	3.7 - 6.4	McDonald	4.2	3.4 - 5.1
Bates	3.0	2.1 - 4.0	Newton	6.6*	5.9 - 7.3
Benton	3.4	2.5 - 4.6	Polk	2.9	2.3 - 3.6
Cedar	5.5	4.2 - 6.9	St. Clair	4.8	3.3 - 6.7
Christian	2.2	1.9 - 2.5	Stone	2.7	2.1 - 3.5
Dade	--	--	Taney	3.1	2.6 - 3.7
Dallas	2.2	1.5 - 3.1	Vernon	10.4*	8.9 - 12.0
Greene	4.3	4.0 - 4.5	Webster	1.9	1.5 - 2.4
Henry	5.9	4.9 - 7.1	Region	4.5	4.4 - 4.6
Hickory	--	--	State	5.2	5.1 - 5.2
Jasper	7.0*	6.5 - 7.5			

*Rate significantly higher than the state rate.

-- Fewer than 20 visits; rate considered unreliable and confidence interval not calculated.

Note: Emergency department rates have been age adjusted based on the U.S. 2000 standard population; county and regional data are reported by patient residence.

Kansas City Metro



Asthma Fact Sheet: 2008-2009

PREVALENCE

- Based on prevalence estimates, approximately 82,000 adults and over 31,000 children younger than age 18 in the Kansas City Metro region are currently living with asthma.
- Current asthma prevalence among adults living in the Kansas City Metro region was 9.1 percent (95% CI 6.8 - 11.4), compared to 9.5 percent (95% CI 8.1 - 10.9) for adults in the entire state.
- Current asthma prevalence among children was 10.5 percent (95% CI 5.8 - 15.1) in the Kansas City Metro region, compared to 10.1 percent (95% CI 7.8 - 12.4) for all children in Missouri.

ASTHMA EMERGENCY DEPARTMENT VISITS

There were 6,882 asthma emergency department (ED) visits in the Kansas City Metro region in 2008.

- The age-adjusted asthma ED visit rate was 5.9 per 1,000 persons, which was significantly higher than the state rate (5.2 per 1,000). See table for ED visit rates by county.
- This region accounted for 23.2 percent of Missouri's total asthma ED visits.
- Children accounted for 40.0 percent of all asthma ED visits in this region, compared to 42.6 percent for the state as a whole.
- African-Americans made up 14.9 percent of the region's population, but accounted for 47.4 percent of all asthma ED visits in the region.
- ED visit rates were significantly higher among females than males (6.5 [95% CI 6.3 - 6.7] versus 5.3 [95% CI 5.1 - 5.4] per 1,000).

ASTHMA HOSPITALIZATION RATES

There were 1,788 asthma hospitalizations in the Kansas City Metro region in 2008.

- The age-adjusted asthma hospitalization rate was 14.9 per 10,000, which was higher than the state rate (13.8 per 10,000). See table for hospitalization rates by county.
- Children accounted for 35.8 percent of all asthma hospitalizations in this region, compared to 34.3 percent for the state as a whole.
- African-Americans made up 14.9 percent of the region's population, but accounted for 40.8 percent of all asthma hospitalizations in the region.

- Asthma led to 5,421 days of hospital care with an average of 3.0 days per hospitalization.
- Charges totaled \$21.1 million for asthma hospitalizations.

DATA SOURCES

PREVALENCE DATA: Missouri Department of Health and Senior Services. Missouri Behavioral Risk Factor Surveillance System, 2008 and 2009. Available at: <http://health.mo.gov/data/brfss/index.php>

EMERGENCY DEPARTMENT AND HOSPITALIZATION DATA: Missouri Department of Health and Senior Services, Bureau of Health Informatics. Missouri Information for Community Assessment (MICA). Available at: <http://health.mo.gov/data/mica/EmergencyRoomMICA>

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Age-adjusted asthma emergency department visits and hospitalization rates by county, Kansas City Metro region, Missouri, 2008

County	Emergency Department Visits		Hospitalizations	
	Rate	95% CI	Rate per 10,000	95% CI
Cass	3.7	3.4 - 4.1	9.4	7.6 - 11.6
Clay	3.9	3.6 - 4.2	12.8	11.3 - 14.4
Clinton	3.6	2.8 - 4.6	8.9	5.4 - 14.0
Jackson	7.5*	7.3 - 7.7	17.7*	16.7 - 18.7
Lafayette	2.7	2.1 - 3.3	12.2	8.6 - 16.7
Platte	2.6	2.3 - 3.0	8.2	6.4 - 10.4
Ray	4.0	3.2 - 4.9	11.9	7.9 - 17.0
Region	5.9*	5.7 - 6.0	14.9*	14.2 - 15.6
State	5.2	5.1 - 5.2	13.8	13.5 - 14.1

*Rate significantly higher than the state rate.

-- Fewer than 20 visits; rate considered unreliable and confidence interval not calculated.

Note: Emergency department rates have been age adjusted based on the U.S. 2000 standard population; county and regional data are reported by patient residence.

St. Louis Metro

Asthma Fact Sheet: 2008-2009

PREVALENCE

- Based on prevalence estimates, approximately 160,000 adults and over 71,000 children younger than age 18 in the St. Louis Metro region are currently living with asthma.
- Current asthma prevalence among adults living in the St. Louis Metro region was 10.1 percent (95% CI 6.6 - 13.6), compared to 9.5 percent (95% CI 8.1 - 10.9) for adults in the entire state.
- Current asthma prevalence among children was higher at 14.0 percent (95% CI 9.0 - 18.9) in the St. Louis Metro Region, compared to 10.1 percent (95% CI 7.8 - 12.4) for all children in Missouri, but this difference was not statistically significant.

ASTHMA EMERGENCY DEPARTMENT VISITS

There were 12,955 asthma emergency department (ED) visits in the St. Louis Metro region in 2008.

- The age-adjusted asthma ED visit rate was 6.4 per 1,000 persons, which was significantly higher than the state rate (5.2 per 1,000). See Table 28 for county and city ED rates.
- This region accounted for 43.6 percent of Missouri's total asthma ED visits.
- Children accounted for 51.6 percent of all asthma ED visits in this region, compared to 42.6 percent for the state as a whole.
- African-Americans made up 19.6 percent of the region's population, but accounted for 63.0 percent of all asthma ED visits in this region.
- ED visit rates were similar among females and males (6.4 [95% CI 6.3 - 6.6] versus 6.3 [95% CI 6.2 - 6.5] per 1,000).

ASTHMA HOSPITALIZATION RATES

There were 3,592 asthma hospitalizations in the St. Louis Metro region in 2008.

- The age-adjusted asthma hospitalization rate was 17.3 per 10,000, which was significantly higher than the state rate. See table for county and city hospitalization rates.
- Children accounted for 39.2 percent of all asthma hospitalizations in this region, compared to 42.6 percent for the state as a whole.
- African-Americans made up 19.6 percent of the region's population, but accounted for 57.2 percent of all asthma hospitalizations in the region.
- Asthma led to 10,359 days of hospital care with an average of 2.9 days per hospitalization.



- Charges totaled \$42.7 million for asthma hospitalizations.

DATA SOURCES

PREVALENCE DATA: Missouri Department of Health and Senior Services. Missouri Behavioral Risk Factor Surveillance System, 2008 and 2009. Available at: <http://health.mo.gov/data/brfss/index.php>

EMERGENCY DEPARTMENT AND HOSPITALIZATION DATA: Missouri Department of Health and Senior Services, Bureau of Health Informatics. Missouri Information for Community Assessment (MICA). Available at: <http://health.mo.gov/data/mica/EmergencyRoomMICA>

POPULATION DATA: Missouri Census Data Center. 2008 Population Estimates for Missouri and the United States. Available at: <http://mcdc2.missouri.edu/trends/estimates.shtml> and Missouri Department of Health and Senior Services. Population MICA. Available at: <http://health.mo.gov/data/mica/PopulationMICA>

Table 28. Age-adjusted asthma emergency department visits and hospitalization rates by county, St. Louis Metro region, Missouri, 2008

County	Emergency Department Visits Rate Per 1,000		Hospitalizations Rate per 10,000	
	Rate	95% CI	Rate	95% CI
Franklin	3.8	3.5 - 4.3	9.4	7.5 - 11.5
Jefferson	3.4	3.2 - 3.7	9.8	8.5 - 11.2
Lincoln	4.9	4.3 - 5.5	6.9	4.8 - 9.6
St. Charles	3.2	3.0 - 3.4	8.3	7.4 - 9.4
St. Louis Co.	6.7*	6.5 - 6.8	18.0*	17.2 - 18.9
St. Louis City	12.2*	11.8 - 12.6	34.2*	32.3 - 36.3
Warren	3.4	2.8 - 4.2	9.3	6.3 - 13.4
Region	6.4*	6.3 - 6.5	17.3*	16.7 - 17.8
State	5.2	5.1 - 5.2	13.8	13.5 - 14.1

*Rate significantly higher than the state rate.

Note: Emergency department rates have been age adjusted based on the U.S. 2000 standard population; county and regional data are reported by patient residence.

Special Focus Areas

Populations and Geographic Areas

About in asthma prevalence and medical utilization are present by race, gender, age, household income, education and geographic location. In 2009, among Missouri adults the prevalence of asthma was higher among African-Americans (10.3%) and other minorities (13.7%) compared to whites (9.0%), but these differences were not statistically significant (Table 29). However, in 2008 among children age 17 and younger, the prevalence of asthma was significantly higher for African-Americans (21.8%) compared to whites (8.5%). The childhood asthma prevalence was also higher for other minorities (10.6%) compared to whites, but this difference was not statistically significant.

In addition to race, the prevalence of asthma was high among people with household incomes below \$15,000 (14.9% adults and 20.8% children age 17 and younger); education attainment less than high school (16.3% adults); male gender in childhood (12.0% versus 8.2%), but female gender in adulthood (11.1% versus 7.8%) and in certain urban and rural counties (Figure 25).

Figure 25. Current asthma prevalence among adults, 18 years and older by county, Missouri, 2007

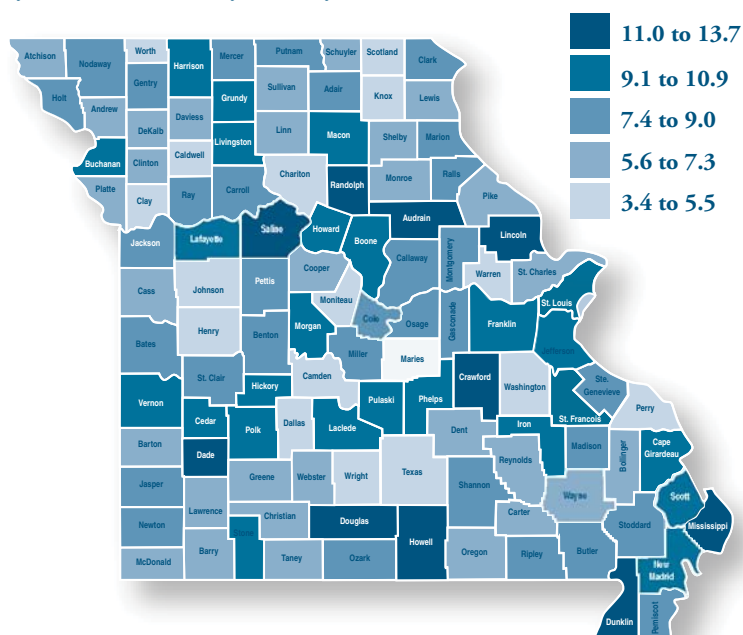


Table 29. Current asthma prevalence* by race, Missouri, adults and children

	Adults			Children	
	Percent	95% CI **	Percent	95% CI**	
White	9.0	7.5 - 10.5	8.5	6.2 - 10.7	
Africa-American	10.3	6.5 - 14.1	21.8	11.6 - 32.1	
Other Minorities	13.7	7.3 - 20.2	10.6	2.8 - 18.4	

See appendices for a list of BRFSS questions.

*Adult prevalence 2009; childhood prevalence 2008.

**Confidence interval.



When ED visits and hospitalizations are considered, children bear a disproportionate burden of asthma, particularly among African-American children and preschoolers, 1 to 4 years of age (Figures 2 and 10). St. Louis City and several Missouri counties demonstrated significantly higher levels of asthma ED visits and/or hospitalizations for children age 14 and younger compared to the state (Table 30). St. Louis City combined with the counties shown accounted for 59.9 percent of the ED visits and 60.7 percent of the hospitalizations for asthma among this age group in 2008.

School Health

Asthma is a major public health problem among children in Missouri and a leading cause of school absenteeism due to a chronic condition. In 2009, the prevalence of current asthma among Missouri public high school students was 8.5 percent and among public middle school students it was 9.1 percent.¹⁹ School nurses in all 523 Missouri Department of Elementary and Secondary Education (DESE) public schools were surveyed to collect data on special health care needs among students in kindergarten through 12th grade.²⁰ In the 2008-2009 school year, 7.7 percent or 66,617 students were reported to be on asthma medication at home and/or at school. In a separate nurses survey of Missouri school districts that contracted with the Missouri School Health Program including 284 schools (232 public and 52

private) representing more than 270,000 students in 2008-2009, reported that 7.9 percent of students had asthma, more than 9,000 (44.2%) students had written asthma action plans and more than 8,000 students were receiving asthma medication at school. An additional 1,000 students were reported in the asthma care coordination program with 88 percent meeting their established care goals.²¹

One of the most important factors for increasing asthma control among students is access to a school nurse trained in asthma care. According to the 2008 School Health Profiles, 79 percent of schools in Missouri have a full-time registered nurse who provides health services to students compared to the national median of 40.2 percent.²² To assist school nurses in caring for children with asthma, the Missouri Asthma Prevention and Control Program (MAPCP), University of Missouri-Columbia and other partners are releasing an update of the Missouri School Asthma Manual as a resource for improving school asthma services. Other measures for improving asthma control include educating school nurses on the most effective inhalation techniques for administering medication to children, recognizing the early signs and symptoms of an asthma attack and monitoring breathing using a peak flow meter or an even more sensitive measure – Forced Expiratory Volume in one second (FEV1). Low FEV1 indicates airflow obstruction and increased risk for an asthma attack.

Table 30. Number and age-adjusted asthma emergency department visits and hospitalization rates for children age 14 and younger by selected cities and counties, Missouri, 2008

City/County	Emergency Department Visits			Hospitalizations		
	Number	Rate	95% CI	Number	Rate	95% CI
		Rate Per 1,000			Rate per 10,000	
St. Louis City	1,818	27.2*	26.0 - 28.5	427	63.9*	58.0 - 70.2
St. Louis County	2,953	15.4*	14.9 - 16.0	632	33.0*	30.5 - 35.7
Jackson County^	1,886	13.0*	12.4 - 13.6	452	31.2*	28.4 - 34.2
Dunklin County	49	7.3	5.4 - 9.7	36	53.7*	37.6 - 74.3
Pemiscot County	31	7.3	5.0 - 10.4	23	54.1*	34.3 - 81.2
Butler County	28	3.4	2.3 - 5.0	38	46.7*	33.1 - 64.1
Missouri	11,295	9.6	9.4 - 9.7	2,650	22.4	21.6 - 23.3

*Rate significantly higher than the state rate.

^Primary county of Kansas City.

There are web-based and in-person trainings and equipment available to prepare school nurses in caring for children with asthma and helping families learn the essentials for controlling asthma. MAPCP, University of Missouri-Columbia, and Missouri School Board Association are partnering to bring programs and interventions such as Asthma Control Everyday (ACE), Asthma Ready, and Teaming up for Asthma Control to school nurses, board members and families to provide the training, skills and information for improving asthma care.²³ MAPCP also sponsors the School Nursing Award to assist and recognize the contribution of school nurses in community-based efforts to improve asthma care. Public health interventions aimed at people with asthma, their families, health care providers and communities and limiting exposure to triggers in the environment where people spend a good deal of their time (home, work, school and day care) are likely to significantly improve asthma outcomes.

For additional information visit:

<http://health.mo.gov/living/healthcondiseases/chronic/asthma/index.php> (MAPCP)

<http://www.asthmahere.org> (Missouri Asthma Coalition and School Nursing Award)

<http://www.asthma-ready.org> (Asthma Ready School resources)

<http://www.cdc.gov/asthma> (Centers for Disease Control and Prevention)

Reducing the Burden and Improving Outcomes

What can be done to decrease the burden of asthma in Missouri and reduce emergency care for asthma attacks? Currently, there are no preventive measures or cure for asthma, so the focus must be on measures to control it, such as:^{24, 25, 26,}

- Proper diagnosis, medication and use of effective inhaling techniques to assure medication reaches the affected air passages.
- Avoiding contact with environmental “triggers.” Environmental triggers include allergens, irritants and pollutants such as cockroaches, dust mites, furry pets, mold, tobacco smoke and certain chemicals.

- Early recognition of reduced airflow and symptoms and prompt relief.
- Treatment of contributing conditions such as obesity and acid reflux disease.
- Programs that educate children and families to improve their asthma control, promote clinical guidelines adoption by health professionals (National Heart Lung and Blood Institute Expert Panel Review III),²⁷ support healthy homes and assist schools and child care centers in helping children control asthma. These programs are being implemented and evaluated in several states.
- Advocate for reimbursement from health plans for self-management education including:
 - o Asthma literacy education by school nurses to students
 - o Standardized key messages by clinicians especially at the first visit
 - o “Preventive Medicine Counseling for Risk Reduction” by a trained clinic-based asthma educator credentialed in the use of standardized, multimedia curriculum during the first three asthma visits (CPT 99402 [30 min]* or 99401 [15 minutes]*)²⁸
 - o When asthma is not well controlled, asthma self-management education for people with very poorly controlled asthma by a trained asthma educator credentialed for the use of a standardized, evidence-based multimedia curriculum (CPT 98960 [30 min])** Always check with individual carriers to find if they cover these services and other information concerning coding.

*Preventive medicine and risk factor reduction and counseling interventions provided as a separate encounter. These codes are based upon the amount of time spent counseling the patient.

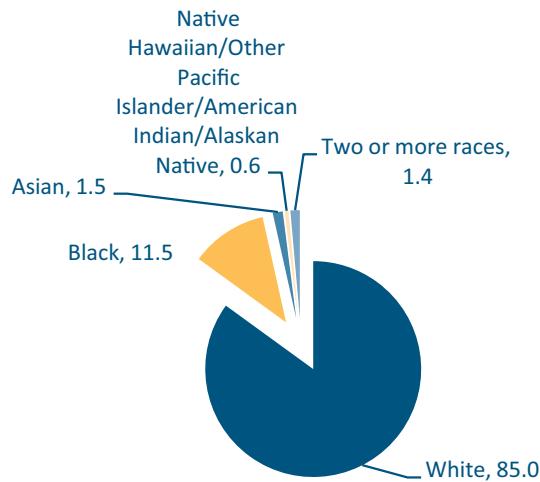
**Education and training for patient self-management by a qualified, non-physician health care professional using a standardized curriculum, face-to-face with the patient (could include caregiver/family). Used usually with a 25 modifier appended to the office/outpatient service code to indicate that a significant, separately identifiable evaluation and management service was provided by the same physician on the same day as the preventive medicine service.

Appendix A

About Missouri: background

Missouri has a 2009 total population estimate of 5,987,580 and is located in the mid-western section of the United States and bordered by eight states - Arkansas, Iowa, Illinois, Kansas, Kentucky, Nebraska, Oklahoma and Tennessee.¹ Missouri's racial composition is shown in the graph below and differs from the U.S. in racial and ethnic composition.²⁹ Missouri was mostly white (85.0%) according to 2009 estimates. This is a higher proportion than in the nation as a whole with whites estimated at 79.6 percent.³⁰ A similar proportion of African-Americans live in Missouri (11.5%) and in the U.S. (12.9%). About three times more individuals in the U.S. were in the "other" race category (7.5%) than in Missouri (3.5%). Only 3.4 percent of Missourians were Hispanic in 2009 compared to 15.8 percent for the nation as a whole. According to the 2009 population estimates, the median age in Missouri was 37.6 years compared to 36.8 years for the U.S. as a whole. Data from the American Community Survey suggest that Missouri is similar to the nation in individuals living below the poverty level (13.7% versus 13.5%) and in housing units without telephone services (4.3% versus 4.2%).³¹

Figure 26. Population estimates by race, Missouri, 2009



Appendix B

About the BRFSS: background

The Behavioral Risk Factor Surveillance System (BRFSS) was developed by the Centers for Disease Control and Prevention (CDC) in the early 1980s and Missouri has been participating since 1986. BRFSS data are collected through random-digit-dialed telephone interviews with adult (18 years or older) residents of the state. Adults may be asked questions about children living in the household as well. The survey contains about 140 questions on demographics and health-related topics. In 2008, the sample size for the Missouri BRFSS was 5,158 and in 2009 there were 5,057 completed interviews. BRFSS data are used for many purposes, including:

- Assessing risk for chronic diseases, infectious diseases and injuries
- Identifying demographic differences and trends in health-related behaviors
- Designing, monitoring and evaluating health interventions and services
- Addressing emergent and critical health issues
- Formulating policy and proposing legislation for health initiatives
- Measuring progress toward achieving state and national health objectives

METHODS:

Statistical significance is determined based on a probability (p) value of less than 0.05 and describes a mathematical measure of difference between groups. The difference is said to be statistically significant if it is greater than what might be expected to happen by chance alone. Prevalence rates are reported as percents.

Variables Used in Missouri Asthma Surveillance Report from 2004 Missouri BRFSS Questions

Prevalence and Risk Factors

ADULT ASTHMA PREVALENCE: LIFETIME	Have you ever been told by a doctor, nurse or other health professional that you had asthma?
ADULT ASTHMA PREVALENCE: CURRENT	Do you still have asthma?
CHILDHOOD ASTHMA PREVALENCE: LIFETIME (BASED ON RANDOM CHILD SELECTION.)	Has a doctor, nurse or other health professional ever said that the child had asthma?
CHILDHOOD ASTHMA PREVALENCE: CURRENT (BASED ON RANDOM CHILD SELECTION.)	Does the child still have asthma?
NO FLU SHOT: ADULT	A flu shot is an influenza vaccine injected into your arm. During the past 12 months, have you had a flu shot?
NEVER HAD A PNEUMOCOCCAL VACCINATION: (AGE 65 AND OLDER)	A pneumonia shot or pneumococcal vaccine is usually given only once ADULT or twice in a person's lifetime and is different from the flu shot. Have you ever had a pneumonia shot?

Appendix C

About the Missouri County-level Study: background

The Missouri County-level Study (CLS) was developed by the Missouri Department of Health and Senior Services (DHSS) with data collection by the University of Missouri (UMC), Health and Behavioral Research Center and initially conducted in 2003 with a sample size of about 15,000. In 2007, the Missouri CLS study was repeated through a partnership with the Missouri Foundation for Health; UMC, Health and Behavioral Research Center; and Macro, International with a sample size of 49,513 adults, age 18 and older. The survey contained about 140 questions on demographics and health-related topics from BRFSS and the CDC Adult Tobacco Survey. CLS data are collected through random-digit-dialed telephone interviews using used standard CDC BRFSS methods and techniques.

METHODS:

- Data were analyzed for those with current asthma and those who do not currently have asthma, which includes those who have never been told they had asthma plus those who had been diagnosed with asthma but do not currently have asthma.
- Statistical significance was determined based on a p value of less than 0.05.
- Sampling goal was 49,200 interviews: 400 in the 107 smallest counties; 800 in Metropolitan Statistical Areas (Boone, Buchanan, Cole, Greene and Jasper); 800 in Jackson County and St. Louis County (with 400 African-Americans and other races and 400 whites); and 800 in St. Louis City (with 400 African-Americans and 400 whites and other races).

SPECIAL NOTES:

- Health-related quality of life refers to a person or group's perceived physical and mental health over time. This is especially important to examine among individuals with chronic diseases, like asthma, in order to examine how a condition affects everyday life.

Variables Used in Missouri Asthma Surveillance Report from 2004 Missouri BRFSS Questions

Factors Increasing Asthma Risks

SMOKED 100 CIGARETTES IN LIFETIME AND CURRENTLY SMOKE SOME OR ALL DAYS

Do you now smoke cigarettes every day, some days or not at all?

SMOKING PERMITTED IN HOME OR THERE ARE NO RULES ABOUT SMOKING INSIDE THE HOME

Which statement best describes the rules about smoking inside your home? Choices read to interviewee (they pick one):

- Smoking is not allowed anywhere inside your home.
- Smoking is allowed in some places or at sometimes.
- Smoking is allowed anywhere inside the home.
- There are no rules about smoking inside the home.

OBESITY

Body mass index. ≥ 30 based on self reported height and weight.

Health Care Access Issues

NO HEALTH CARE COVERAGE

Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare?

NO USUAL PLACE FOR HEALTH CARE

When you are sick or need advice about your health, to which one of the following places do you usually go? Would you say a doctor's office, a public health clinic or community health center, a hospital outpatient department, a hospital emergency room, urgent care center, some other kind of place or no usual place?

NEEDED MEDICAL CARE IN THE PAST 12 MONTHS
BUT COULD NOT GET IT

Was there a time in the past 12 months when you needed medical care but could not get it?

UNABLE TO OBTAIN HEALTH CARE DUE TO COST

What is the main reason you did not get medical care? Would you say:

- Cost/No insurance
- Distance
- Office wasn't open when I could get there
- Too long a wait for an appointment
- Too long a wait in waiting room
- No child care
- Transportation
- No access for people with disabilities
- The medical provider didn't speak my language
- Other

Health-related Quality of Life

FAIR OR POOR GENERAL HEALTH

Would you say that your general health is: (Choices read to interviewee they pick one) Excellent, Very good, Good, Fair, Poor

14 OR MORE PHYSICALLY UNHEALTHY DAYS AND MEAN
NUMBER OF PHYSICALLY UNHEALTHY DAYS

Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?

14 OR MORE MENTALLY UNHEALTHY DAYS AND MEAN
NUMBER OF MENTALLY UNHEALTHY DAYS

Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?

ACTIVITY LIMITATION

Are you limited in any way in any activity because of physical, mental or emotional problems?

MEAN NUMBER OF ACTIVITY LIMITATION DAYS

During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work or recreation?

Appendix D

About the ACBS: background

The Asthma Call Back Survey (ACBS) was developed by the Centers for Disease Control and Prevention (CDC). It began as the National Asthma Survey linked to the National Immunization Survey conducted through the State and Local Area Integrated Telephone Survey. In 2005, it was implemented as a call-back survey in conjunction with BRFSS in three states – Michigan, Minnesota and Oregon. Missouri began conducting the ACBS in 2006. Adults reporting a person or child in the household with a history of asthma and agreeing to be re-contacted are called-back and asked questions regarding their (or the child's) asthma. The survey contains about 100 questions on demographics and asthma-related topics. In 2006, the sample size for the Missouri ACBS was 362 adult and 97 child interviews completed. Missouri ACBS data are used for many purposes, including:

- Monitoring the history, symptoms and control of asthma
- Identifying the knowledge of asthma and management plans
- Assessing environmental triggers and comorbid conditions
- Designing, monitoring and evaluating asthma interventions and services
- Formulating policy for asthma health initiatives
- Measuring progress toward achieving state and national health objectives

METHODS:

Statistical significance is determined based on a probability (p) value of less than 0.05 and describes a mathematical measure of difference between groups. The difference is said to be statistically significant if it is greater than what might be expected to happen by chance alone. Prevalence rates are reported as percents.

Variables Used in Missouri Asthma Surveillance Report from 2004 Missouri BRFSS Questions

Factors Increasing Asthma Risks

CURRENT JOB CAUSED ASTHMA

Was your asthma caused by chemicals, smoke, fumes or dust in your current job?

PREVIOUS JOB CAUSED ASTHMA

Was your asthma caused by chemicals, smoke, fumes or dust in any previous job?

EVER CHANGED OR QUIT A JOB BECAUSE MADE ASTHMA WORSE

Did you ever change or quit a job because chemicals, smoke, fumes or dust caused your asthma or made your asthma worse?

Appendix E

About the PAS and Vital Statistics Data: background

The Patient Abstract System (PAS) provides information (e.g., diagnoses, procedures, charges, days of care, demographics, visits and patient discharges) on Missouri residents seen both as hospital outpatients and inpatients in Missouri and several surrounding states. The system is based on hospital data from the Missouri Hospital Association and has been maintained by DHSS since 1993. Emergency department data reflect individuals who were treated and released or died. Emergency department visits that result in an admission are included in the hospital discharge data only.

Missouri Vital Statistics death data are obtained from death certificates. DHSS is the official state registrar of Missouri vital statistics data such as births, deaths, marriages, etc. Vital statistics data are available through the web-based Missouri Information for Community Assessment (MICA) interactive system that allows users to create, view, and download tables containing health data from various data sources about Missouri residents. MICA allows the user to examine data statewide or by characteristics such as age, sex, race, ethnicity and county/city of residence. Data may be accessed for one year or multiple years. Confidentiality rules are applied in the data displayed to avoid identification of individuals. Statistics displayed in this report may be slightly different from that found in the current ED MICA due to revisions in the population estimates. MICA can be accessed at <http://health.mo.gov/data/mica/MICA>. Missouri PAS and vital statistics data are used for many purposes, including:

- To answer important questions about the impact of asthma on Missouri using ED, hospitalization, and death data
- To explore differences in asthma ED and hospitalization rates by age, sex, race and expected payment source
- To explore differences in asthma death rates by age, sex and race
- To compare Missouri findings to national data
- To describe trends in asthma ED visits, hospitalizations and deaths

METHODS:

- Rates are based on the population in question (e.g., Missouri residents, males, African-Americans).
- Emergency department rates are reported per 1,000 population.
- Hospitalization rates are reported per 10,000 population.
- Death rates are reported per 100,000 population.
- Age-adjustment uses the U.S. 2000 standard population.
- Crude or age-specific rates are also reported.
- Statistical significance is determined based on a p value of less than 0.05 with 95% confidence interval selection.

SPECIAL NOTES:

- Data are reported for Missouri residents only.
- Data in this report have asthma as the primary diagnosis or primary cause of death.

- Generally, data are reported for the most recent year of data available: for ED visits, hospitalizations and deaths, at the time this report was prepared the latest year was 2008. To observe asthma ED visits and hospitalizations over time multiple years are shown. For deaths the latest year was 2009, and the years 1999-2009 are combined due to the small number of asthma deaths each year.
- Payment source information presented in this report is the first listed expected source of payment (e.g., commercial insurance, Medicaid, Medicare, etc.) on the ED visit or hospitalization claim record.



Definitions

- AGE-ADJUSTED RATE** A procedure for adjusting rates, designed to minimize the distortions created by differences in age distributions (and permit fair comparisons) when comparing rates for populations with different age compositions or when comparing rates from different populations or when comparing rates in the same population over time.
- AGE-SPECIFIC RATE** Rates computed by dividing the number of events in an age group in a geographic area by the estimated population of the same age group/area and then multiplying by 100,000 or the appropriate multiplier.
- CONFIDENCE INTERVAL (CI)** Range of values for a rate that will include the true value of the rate a given percentage of the time. For example, a 95% CI includes the true value of the rate 95% of the time.
- CRUDE RATE** A rate is a measure of some event, disease, or condition in relation to a unit of population, along with some specification of time. The term “crude” distinguishes rates that are adjusted for some characteristic such as age.
- MEDIAN** A common measure of central tendency and is the middle value of the distribution. It is less affected by extreme or outlying values and is the preferred measure for skewed distributions.
- POPULATION ESTIMATES** An estimate of the total Missouri population (by age, gender, race, county) produced and developed by DHSS using information from the U.S. Census Bureau and the Federal State Cooperative Program for Population Estimates.
- PREVALENCE** The proportion (usually a percentage) of a population that has a defined risk factor, disease, or condition, at a particular point in time. Although usually called a “rate,” it is actually a proportion.
- RATE** A rate is a ratio of those having the event of interest to the population of those at risk of having the given health event. Rates are calculated by dividing the number of events by the population at risk, or a related population, and then multiplying by a constant.
- RATE RATIO** The ratio is the rate of the disease (e.g., asthma) in a specific group compared to another group or the total population regarding a particular outcome. A RR of “1” indicates that the rates are the same in the two groups. However, a RR above “1” indicates that those in this group are more likely to have the outcome. In contrast, a RR below “1” indicates that those in this group are less likely to experience the outcome.
- STANDARD POPULATION** A set of arbitrary population weights whose proportions are used as the standard in adjusting rates for different groups in order to eliminate differences between the rates which are based on their composition. The U.S. 2000 standard population is often used when calculating age-adjusted rates. To compare adjusted rates, the same standard population must be used.

References

1. Missouri Department of Health and Senior Services. *Population MICA*. Available at: <http://health.mo.gov/data/mica/PopulationMICA>
2. Missouri Department of Health and Senior Services. *Missouri Behavioral Risk Factor Surveillance System Data Reports*. Available at: <http://health.mo.gov/data/brfss/index.php>
3. National Center for Health Statistics, CDC. (2010). *National Health Interview Survey Data*. Available at: <http://www.cdc.gov/asthma/nhis/08/table2-1.htm>
4. Centers for Disease Prevention and Control. *Behavioral Risk Factor Surveillance System*. Available at: <http://www.cdc.gov/brfss>
5. Centers for Disease Control and Prevention. (2009). Important asthma triggers. Available at: <http://www.cdc.gov/asthma/triggers.html>
6. Subbarao, P, Mandhane, PJ, & Sears, MR. (2009). Asthma: epidemiology, etiology and risk factors. *Canadian Medical Association Journal*, 181(9), E181-E190.
7. Missouri Department of Health and Senior Services. *Missouri County-level Study*. Available at: <http://health.mo.gov/data/cls/index.php>
8. Homan, SG, Kayani, N & Gaddy P. (2010). *Asthma in Missouri: Are we controlling it or is it controlling us?* Council of State and Territorial Epidemiologists. Annual conference poster presentation. Available at: <http://health.mo.gov/living/healthcondiseases/chronic/asthma/publications.php>
9. Tarlo, SM, Balmes, J, Balkissoon, R., et al. (2008). Diagnosis and management of work-related asthma: American College of Chest Physicians Consensus Statement. *Chest*, 134(3 suppl), 1S-41S
10. Missouri Department of Health and Senior Services. (2006). *Missouri Asthma Call-back Survey Data – Lifetime Asthma Analysis*. Jefferson City, MO: Division of Community and Public Health, Office of Epidemiology.
11. Missouri Department of Health and Senior Services. *Emergency Room MICA*. Available at: <http://health.mo.gov/data/mica/EmergencyRoomMICA/>
12. U.S. Social Security Administration. (2011). *How to qualify for Medicare*. ID#400. Baltimore, MD. Available at: http://ssa-custhelp.ssa.gov/app/answers/detail/a_id/400/-/how-to-qualify-for-medicare
13. Niska, R, Bhuiya, F, & Xu, J. (2010). National Hospital Ambulatory Medical Care Survey: 2007 emergency department summary. *National Health Statistics Reports*, No. 26. Hyattsville, MD: National Center for Health Statistics. Available at: <http://www.cdc.gov/nchs/data/nhsr/nhsr026.pdf>
14. U.S. Department of Health and Human Services. *Healthy People*. Washington, DC: Office of Disease Prevention and Health Promotion. Available at: <http://www.healthypeople.gov/2020/default.aspx>
15. National Center for Health Statistics. (2011). CDC Wonder Data 2010. Hyattsville, MD: Health Promotion Statistics Branch. Available at: <http://wonder.cdc.gov/data2010>
16. Missouri Department of Health and Senior Services. *Hospital Discharges, Charges, and Days of Care MICA*. Available at: http://health.mo.gov/data/mica/D_C_DofCMICA
17. Hall, MJ, DeFrances, CJ, Williams, SN, Golosinskiy, A, & Schwartzman, A. (2010). *National Hospital Discharge Survey: 2007 Summary*. National health statistics reports; no 29. Hyattsville, MD: National Center for Health Statistics.
18. Bureau of Labor Statistics. (2011). Consumer Price Index and Medical Care Services. Washington DC: United States Department of Labor. <http://www.bls.gov/data>
19. Missouri Department of Health and Senior Services. Chronic Diseases and Risk Factors Among Missouri Public Middle and High School Students. *Youth Tobacco Survey*. Available at: http://health.mo.gov/data/yts/pdf/2009_yts_chronic_fact_sheet.pdf
20. Missouri Department of Health and Senior Services. *Missouri School Health Services Program Special Health Care Needs Survey, 2008-2009*, unpublished data.
21. Missouri Department of Health and Senior Services. *Missouri School Health Services Program Contractor Survey, 2008-2009*, unpublished data.
22. Centers for Disease Control and Prevention. Missouri – Selected Topics Fact Sheet, Profiles 2008. The School Health Profiles. Available at: <http://www.cdc.gov/healthyyouth/profiles>
23. Francisco, B. et al. *Asthma Ready; Asthma Control Everyday; and Teaming up for Asthma Control*. Columbia, MO: University of Missouri Health Care. Available at: <http://www.asthmaready.org>

24. Francisco, B, & Klein, T. (2005). Childhood Asthma: Understanding and addressing the public health problem. *Missouri Youth Initiative*, 15 (5).
25. The Task Force on Community Preventive Services. (2010). Asthma control: home-based multi-trigger, multicomponent intervention. *Guide to Community Preventive Services*. Available at: <http://www.thecommunityguide.org/asthma/multicomponent.html>
26. Centers for Disease Control and Prevention (CDC), National Center for Environmental Health. *Asthma interventions*. Available at: <http://www.cdc.gov/asthma/interventions.htm>
27. National Heart Lung and Blood Institute. (2007). National Asthma Education and Prevention Program Expert Panel Report 3: Guidelines for the diagnosis and management of asthma. Available at: <http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf>
28. American Medical Association, National Highway Traffic Safety Administration, & US Department of Transportation. (2003). Appendix A - CPT® Codes. Available at: <http://www.ama-assn.org/ama1/pub/upload/mm/433/appendixa.pdf>
29. Missouri Secretary of State, Missouri Census Data Center. Missouri, its counties and CBSA's thru July 2009. *Population Estimates for Missouri and Across the U.S.* Available at: <http://mcdc2.missouri.edu/trends/estimates.shtml>
30. U.S. Census Bureau. Population Estimates Program. Available at: <http://www.census.gov/popest/estimates.html>
31. U.S. Census Bureau. *American Community Survey*. Available at: <http://www.census.gov/acs/www>

Missouri Asthma Prevention and Control Program
Missouri Department of Health and Senior Services
P.O. Box 570
Jefferson City, Missouri 65102-0570

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